Practical Facial Reconstruction

THEORY AND PRACTICE

Andrew J. Kaufman

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Dedication

To my mother, short on this earth but forever in my heart and soul;

To my father, an ideal role model as physician, father, and friend;

To my brother Bobby, a hero and the embodiment of strength and bravery;

To my wife, Jayme, for her love and support, and my children, Madeline and Ethan, for whom I wish a world of love, happiness, and peace;

And to my patients, who have provided the trust, respect, and gratitude that make the subject of this book so rewarding.

Foreword

I write this foreword to *Practical Facial Reconstruction, Theory and Practice* to introduce this topic and encourage readers to study and enjoy the contents from beginning to the end. Andrew Kaufman is a talented and experienced surgeon with a long history of teaching experience to residents, fellows, and established physicians locally, nationally, and internationally. He is a premier surgeon and a leader in facial reconstruction and has contributed a great deal to our specialty. His knowledge and experience through this book adds significantly to the teaching of facial reconstruction. It is a masterpiece and should be studied by students and established physicians of all specialties involved in facial reconstruction. It is more than an atlas or a textbook. In this book, Dr. Kaufman's style is to present the rationale for a given reconstruction that teaches the reader the thought process for the choice of repair. He shows what tissue is missing, explains where to harvest available replacement tissue, and then demonstrates the most efficient way to move it. Next, he gives the pearls, tips, and important smaller details that allow the reader to take this knowledge into the operating suite and obtain the best results. The photographs are of high quality, and the drawings add significantly to the teaching and to the understanding by the reader. The summary pearls are helpful when browsing and to remember the important points of each repair. The book can be read slowly for detailed learning or used to browse for new tips and ideas. This is a book for everyone interested in facial reconstruction, including dermatologists, plastic surgeons, otolaryngologists, and general surgeons. It will be a valuable text for students and a resource for any experienced surgeon looking for ideas for complex cases. Dr. Kaufman's experience highlights beautiful results and gives the reader principles that will enhance any surgeon's surgical skills with repeatable and reliable outcomes.

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Preface

Facial reconstruction can be one of the most rewarding aspects of medicine. Taking a surgical defect or traumatic wound and creating a result that preserves function and restores appearance is tremendously satisfying not only to the patient but also to the surgeon. This is one characteristic of reconstructive surgery that has drawn physicians from varied specialties to study, practice, and excel at facial repair. Reconstruction of the face not only restores a patient's public appearance but also impacts his or her public persona and personal self-image. This degree of importance is evident in the initial consultation when a patient may voice concerns about the surgery and the resultant scar and is equally conspicuous in the patient's gratitude and kindness at the postoperative visit when viewing and discussing the final result.

To be successful, a repair must accomplish both aesthetic and functional goals. A nasal repair that looks flawless but decreases air flow because of impairment of the internal nasal valve is not a complete success. Similarly, repair of the eyelid that provides protection of the globe and avoids ectropion but leaves an unsightly scar across a cosmetic unit is also not completely successful. Both aesthetic and functional goals should be met for "success," but sometimes it is not possible to completely reach those goals in one surgical procedure. The functional goals should be addressed and achieved in the planning and primary surgical procedure whenever possible. However, sometimes the ultimate cosmetic goals may require additional procedures to "soften" or "fine-tune" the final cosmetic result through scar abrasion, scar revision, intralesional steroids, or lasers.

There are several excellent textbooks available that detail facial reconstruction, covering both the principles and designs of repairs and regional approaches to repairs. What I try to do in this book is describe a complementary approach to repair that focuses on teaching a **practical** way to evaluate a surgical defect, analyze it, and design and execute a repair that works best for that defect in that location for that patient. Rather than memorize particular types of repairs for particular locations, master

an approach to facial repair that inspires creativity and adaptability. As such, this book is not meant as a primer on basic facial repair, but instead complements other more comprehensive textbooks as a readable and practical approach to enhancing one's expertise at facial reconstruction. A reader will benefit most from having at least a basic understanding of facial anatomy, surgical technique, and biomechanics.

My second goal is to attempt to simplify or demystify some useful reconstructive techniques. Having taught residents and fellows and lectured on reconstruction for many years, I have been impressed that some very useful repairs are quite intimidating to many surgeons. Some of this may be attributable to lack of experience in performing the repair or perhaps to gaps in their reconstructive education. Some of it may be explained by the complex geometry in designing the repair and the potential downside to miscalculation or improper execution. I have tried to elucidate the exact points in design and execution of these repairs that simplify them and help to guarantee success. And for the seemingly more complicated repairs (e.g., bilobed transposition flaps, helical rim advancement flaps), I have provided an almost formulaic description as well as artistic illustrations that help to demonstrate key principles for completing that reconstruction.

Each defect is slightly different; each repair is unique. My ultimate goal is to make the reader think, preferring not to espouse a particular repair for a particular defect, but to enhance flexibility and ingenuity. These characteristics distinguish an innovative surgeon and ultimately elevate the care you provide your patient.

Andrew J. Kaufman, MD, FACP

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Special thanks to Timothy C. Hengst, FAMI, CMI, an amazingly talented, respected, and patient medical illustrator, who helped me to explain some key principles in this book.

Special thanks also to John A. Zitelli, MD, for agreeing to write the Foreward in this book. Dr. Zitelli has been a friend and a source of inspiration, and his lectures and published articles are a valuable resource to those interested in understanding reconstructive surgery.

Special thanks also to the front office, back office, and nursing staff who have worked with me through the years and who help make my surgeries easier to accomplish and my life easier to enjoy.

HISTORICAL NOTE: MOULAGE OF FOREHEAD FLAP

(Moulage from author's collection. Image previously published in Kaufman A. J. Moulage: The forehead flap. *Dermatol Surg* 2003;29:402.)

Moulages were wax models created by artisans during the 18th and 19th centuries within Europe and America as clinical teaching models to

convey the three-dimensional, life-size appearance of disease processes as well as surgical procedures. The moulage shown here from the latter part of the 19th century depicts the Forehead Flap, also previously referred to as the "Indian Rhinoplasty."

The origin of the forehead flap dates to the 6th century BC., when it was described in an ancient Sanskrit text on medicine and surgery, the Sushruta *Samhita*. A caste of potters or brickmakers in India developed the forehead flap as well as a cheek flap for nasal reconstruction. With the translation of the *Samhita* in Sicily during the 15th century, surgeons like Branca de Branca and his son, Antonius, embraced the new technique and added more sites of donor tissue (e.g., arm) as well as recipient repair sites (e.g., lips and ear). Gaspare Tagliacozzi further improved upon surgical reconstruction techniques for nasal reconstruction, in particular, the use of the arm for donor tissue (later referred to as the "Italian Method" of rhinoplasty) and published his treatise, *De Curtorum Chirurgia per Insitionem,* in 1597. Although Tagliacozzi's text was popular among surgeons, religious and political views disapproved of the concept of changing one's appearance even for reconstructive purposes, and it was not until 1794 that the surgical technique reached an English-speaking audience. A Letter to the Editor in *Gentleman's Magazine* described the Indian Forehead Flap in the reconstruction of the nose of a bullock driver for the English army whose nose and one hand were amputated while he was a prisoner of Tippoo Sultan. Twenty-two years later, an English surgeon, J.C. Carpue, described his use of the technique in an account of the reconstruction of the noses of two army officers. Over the remainder of the 19th century, many more forehead flaps and various iterations of the forehead flap were performed, but it was not until the latter part of the 20th century when the full utility of this interpolation flap was appreciated. Now, subtleties in design and execution as well as the need for structural support and restoration of nasal lining make the paramedian forehead flap an important technique for repair of larger nasal defects, and its history a key turning point in facial reconstruction.

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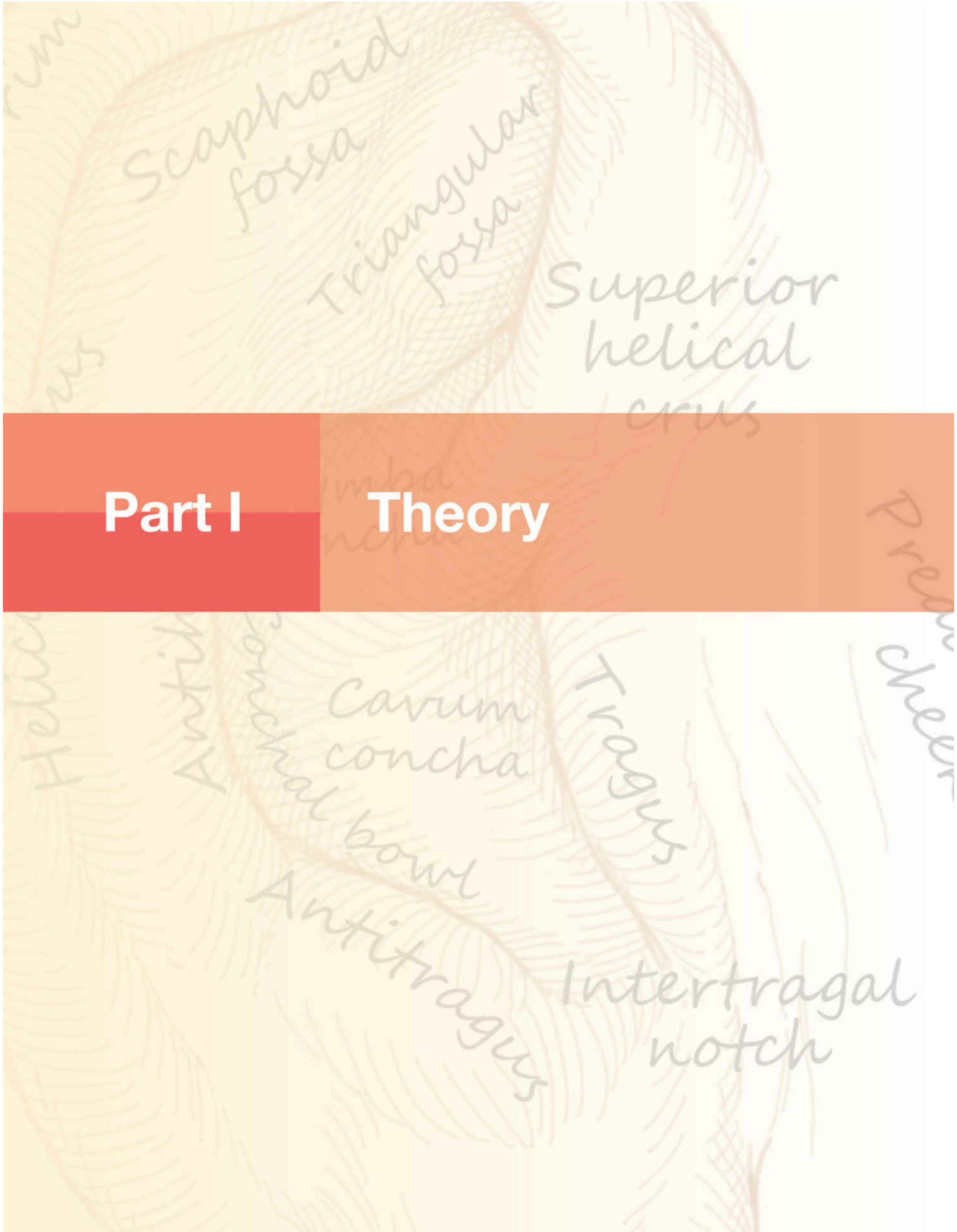


1 Principles, Design, Completion

1.1 PRINCIPLES OF RECONSTRUCTION

The first step in cancer surgery is to ensure clearance of the tumor. Neither cosmetic nor functional goals can be met if the results are short-term, and the patient will require further surgery to remove persistent tumor. Taking too narrow a surgical margin or leaving positive surgical margins untreated will likely doom the patient to more extensive cancer surgery and reconstruction in the future. Although adjuvant radiation therapy may help “clean up” some residual tumor cells in some situations, a better, more consistent option may be to consider Mohs micrographic surgery as a primary method to clear difficult or recurrent skin cancers before reconstructive surgery.

Mohs surgery was first described in the 1930s by Dr. Frederic Mohs. At that time, the procedure was described as “chemosurgery” in reference to the zinc chloride paste that was applied to the tumor prior to surgery. This process fixed the tissue “in situ,” and although it made surgical excision of the tumor easier in some ways, it made immediate postoperative reconstruction of this devitalized wound bed impossible. Although Dr. Mohs did perform the procedure without zinc chloride paste in certain locations such as the eyelids, several other physicians began utilizing Mohs surgery without zinc chloride paste in the 1970s, a procedure subsequently referred to as “fresh tissue technique.” Today, almost every case of Mohs surgery is performed without the tissue fixative, and the procedure is termed Mohs micrographic surgery. The two greatest benefits of the procedure are that it provides the highest cure rate for most primary and recurrent skin cancers and preserves the greatest amount of healthy tissue around the tumor site. Even if another surgeon will be performing the reconstruction, it may be in the patient’s best interest to have the tumor removed by Mohs surgery. And for the surgeon performing the reconstruction, the benefits of highest cure rate (i.e., less chance of performing another excision and repair in this area) and greatest preservation of healthy tissue (i.e., more healthy adjacent tissue means

more options for local flap or side-to-side repair) should sound like a good option.

After cancer removal, we address the two goals in reconstruction: functional and aesthetic. Both of these should be addressed in consultation with the patient, and one should get a sense of whether one's ability and goals will match the patient's expectations. (See also Section 1.3.) As mentioned before, selection and performance of reconstructive technique needs to address functional as well as aesthetic requirements. Functional requirements may include the eyelids' protection of the globe, the lips' retention of food and liquids, the ears' collection of sound, and the nostrils' movement of symmetric and uninterrupted air flow. Each of these functional requirements can be disturbed by a poorly planned or executed reconstruction. A suboptimal aesthetic result can more easily be addressed in a subsequent or revision surgery; however, the preference is to reach both goals first time around.

In considering **any** defect for reconstruction, **three questions** should be considered:

1. What is missing?
2. Where am I going to find the replacement tissue?
3. How am I going to get it there and hide most of the subsequent scars?

Let us examine each of these.

"What is missing?" Each defect is different. Does the defect involve only skin and soft tissue, or is structural integrity also missing? If only skin and soft tissue, is it superficial or deep? Is it in an area where second intention healing may provide excellent results? Many defects in concave areas heal quite well through proper wound care and the body's own innate mechanism of wound repair. As a result, many defects of the conchal bowl may best be treated by good wound care and second intention healing (Section 7.4). Defects on the temple too large to easily repair with a side-to-side or flap repair can also be allowed to heal by second intention healing (Section 4.8). Superficial defects on the medial canthus (especially if balanced above and below the medial canthal tendon and not adjacent to the lid margin) and superficial defects on concave areas of the nose (e.g., alar crease) can also be allowed to heal by second intention healing with exceptional results.

Now, if the defect is deeper or impacts structural support or is on a convex surface or crosses into another cosmetic unit or subunit, one should consider other options. Deeper defects, especially if near a free margin (e.g., eyelid or vermilion border) or anatomical landmark (e.g., eyebrow or nasal tip), should be repaired to minimize scar contraction and thereby minimize the risk of deviation of the free margin or landmark. So although large defects on the temple can be allowed to heal by second intention healing with exceptional results, if that defect approaches the lateral canthus or the tail of the eyebrow, a repair should be considered to minimize the risk of distortion of the lateral canthus or eyebrow. In these instances, it might be worth the extra time and work to place a full-thickness or split-thickness skin graft on the temple defect because the graft will decrease the chance of wound contraction and subsequent distortion (Section 8.6F–H).

If the defect involves structure or if contraction of the wound might compromise function, one should consider structural support via cartilaginous grafting. Most surgeons agree that if structural support is missing (e.g., nasal tip) or if there is a possibility of impairment of function (e.g., over the internal or external nasal valves), then one should replace or restore the structural integrity of the anatomy. Similarly, when nasal mucosa is missing, it should be replaced because although small full-thickness nasal defects may heal without complication, larger defects repaired without mucosal replacement may heal with significant contraction and distortion. In fact, the earliest midline forehead flaps (see image of moulage of forehead flap in front matter of book) were often fraught with this complication, and it was not until various methods to address the missing nasal mucosa and structural support were developed that the aesthetic utility of this flap for complicated nasal repair was truly recognized.

So, if superficial, consider second intention healing, especially on a concave surface away from free margins and anatomical landmarks. If deeper, consider reconstruction of some method. If there is a specific cosmetic or functional quality to the missing tissue, such as the hair-bearing eyebrows or lining of the nasal vestibule, replace with tissue of similar characteristic (Section 4.2). And if structure is missing or structural support is needed to decrease the chance of functional or aesthetic distortion, reconstruct the structure or add adequate support to avoid distortion.

The second question is "Where are you going to find the replacement tissue?" The tissue with the greatest similarity to the missing skin of the defect (i.e., color, texture, thickness, adnexal structures, actinic damage) is tissue from the *same* cosmetic subunit adjacent to the defect. Unfortunately, tissue within the same cosmetic subunit is frequently inadequate for reconstruction, but the tissue with the second greatest similarity to the tissue being replaced is probably within an *adjacent* cosmetic subunit. This similarity allows local flaps to be an excellent reconstructive option in repair of defects on cosmetically sensitive areas. Tissue of similar color, texture, and thickness is being used to repair the defect. As a result, local flaps tend to be a superior reconstructive option compared with grafts for repair of these areas. This is especially true over convex areas (e.g., nasal tip) or deeper defects, where grafts cannot reconstruct the depth of the wound but only its surface. In cases where the defect is too large for repair with a local flap, you might have to go to another cosmetic unit to find the replacement tissue. For large or deep or complicated defects on the nasal tip, this might be the forehead, where a paramedian forehead flap might be the best alternative (e.g., Section 5.12). For a similar complex defect on the nasal ala or soft triangle of the nasal tip, one might consider a cheek-to-nose interpolation flap from the medial cheek (Section 5.11). Both the forehead and the cheek have similar characteristics to the skin of the distal one-third of the nose and are excellent sites for replacement tissue. If the defect is superficial but too big for local flap repair, another alternative is a full-thickness skin graft. Although the usual donor site may be the pre- or postauricular skin or the supraclavicular area (Section 4.4), an alternative is to use adjacent tissue for the skin graft, a procedure that has been referred to as an adjacent-tissue skin graft or a Burows' graft. In this instance, tissue adjacent to the surgical defect is used as a donor site for the full-thickness skin graft. This may be particularly useful in defects that extend beyond one cosmetic unit or subunit into another. In these cases, one closes the defect in individual cosmetic units or subunits and in doing so, creates redundant tissue that is used to repair the remaining surgical defect (Section 8.6).

Finally, we have to ask, "How are you going to move the needed tissue from where it is located to where you need it?" The trick here is to accomplish this feat without distortion of anatomical landmarks or free margins and hide incision lines (and thus subsequent scars) as well as possible. To avoid the former, proper design of the side-to-side or flap repair is essential to avoid **secondary tension vectors** (i.e., tension caused

by execution of the repair), which could distort nearby free margins or landmarks. For the latter, consider placement of incision lines within rhytides, furrows, or the junctions between cosmetic units or subunits. It is likely that these two factors discourage less experienced reconstructive surgeons from considering local flap repairs. It is much easier to place a full-thickness skin graft on a surgical defect than to worry about secondary tension vectors or hiding incision lines even if a local flap will provide a more similar skin surface and reconstruct depth as well.

So, if each defect is approached in the same logical, step-by-step manner, the reconstructive process becomes **easier** and **adaptable** to different situations. Rather than trying to remember a specific repair for a specific site, it is more useful and versatile to consider the following questions: what is missing, where are you going to find its replacement, and how are you going to get it there?

1.2 ANATOMICAL CONSIDERATIONS

When considering facial reconstruction, certain anatomic considerations become critical. The reconstructive surgeon needs to understand cosmetic units and subunits and what defines the structures that he or she is trying to reconstruct. This requires an understanding of the biomechanical features of skin and of basic geometry. It is also important to have a thorough knowledge of facial anatomy, including neurovascular and other structures, and where these nerves, blood vessels, ducts, etc., are most like to be in jeopardy.

As mentioned previously, when considering facial reconstruction, one should remember that concave areas frequently heal very well when allowed to heal by second intention healing. Second intention healing should therefore be considered as a possibility in the concave areas of the temple, ear, nose, and medial canthus. Frequently, one would be hard-pressed to perform a repair in these areas that produces a better cosmetic result than that performed by Mother Nature (Sections 4.8 and 7.4).

Another consideration is to place incision lines where they will be least noticed when healed. **Relaxed skin tension lines (RSTL)** are most obvious as rhytides, wrinkles, or furrows and tend to run perpendicular to the underlying musculature in the area **(Fig. 1.1)**. In some areas and in some patients, RSTL are obvious; in others, they are less so, and the

surgeon needs to plan incisions and closures where RSTL would be anticipated (e.g., young patients without rhytides). Another location where incisions and the healed scars are well hidden is at the junction of cosmetic units or even the junction of cosmetic subunits. In these areas, the subtle nuances in light and shadow or changes in color or texture tend to hide incisions well.

Defects that cross from one cosmetic unit to another, such as from the nose to the cheek, should be considered for repair by more than one repair. A flap that bridges two cosmetic units is usually more noticeable than two flaps or a side-to-side repair combined with another repair (e.g., flap or graft) that reconstructs the two cosmetic units separately. The human eye and brain more easily detect subtle changes in facial topography and asymmetry. It is much better to maintain symmetry and the expected convexities and concavities that distinguish cosmetic units than to try to repair a multiunit surgical defect with just one repair.

In a related manner, distortion of anatomical landmarks or free margins must be avoided at all costs. **Anatomical landmarks** are conspicuous anatomical features that define the characteristics of the cosmetic unit or subunit. These include obvious landmarks such as the nasal tip and philtrum of the upper lip but also less obvious structures such as the eyebrow or melolabial furrow. Distortion of these landmarks is apparent because they occupy a central prominent facial location, because they define the features of the cosmetic unit, or because they are paired with another structure and any change in one causes obvious facial asymmetry. **Free margins** include the eyelid margin, alar rim, and lip margin. These free edges are more susceptible to distortion because at least in one direction, they are not tethered or secured.

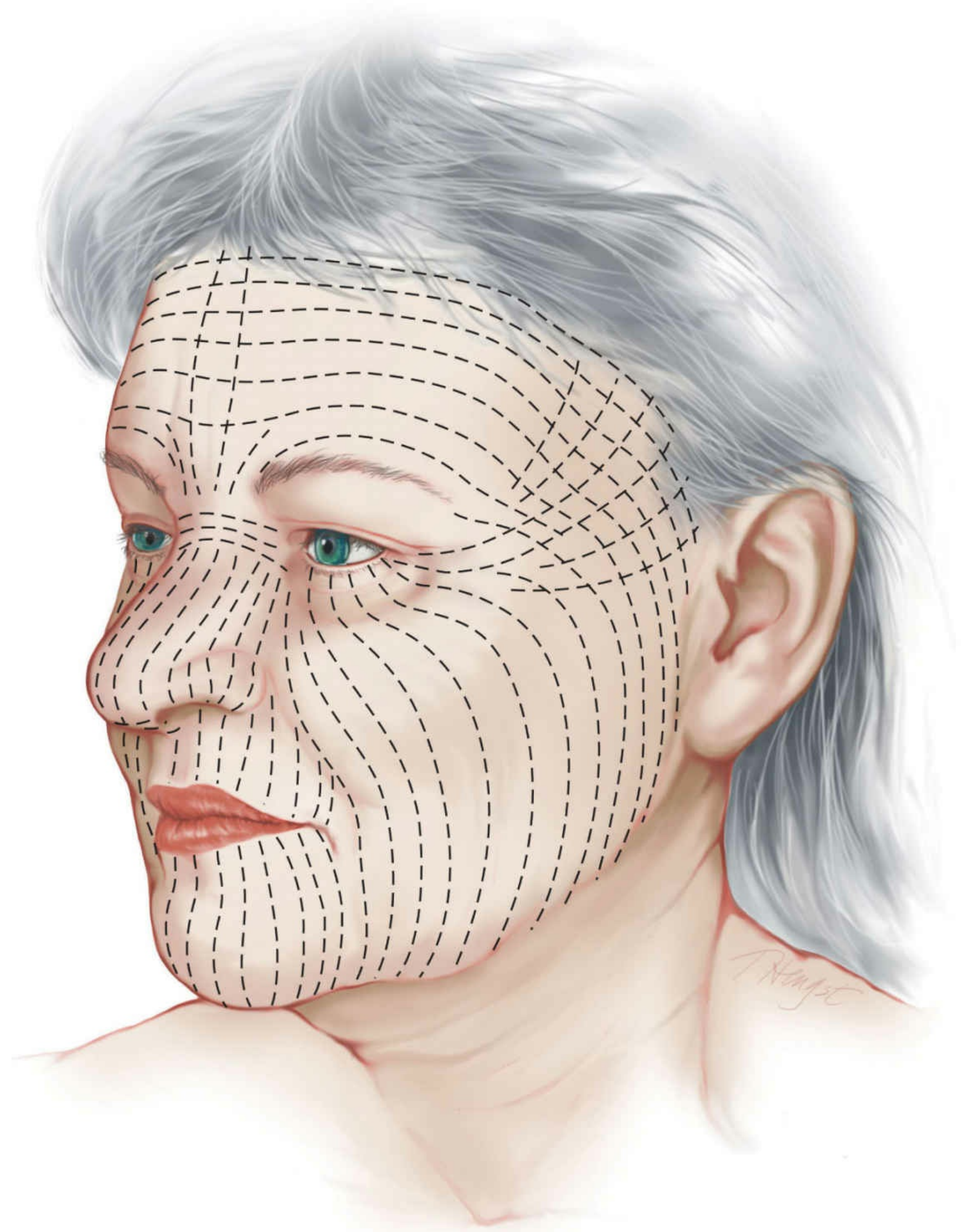


Figure 1.1. Relaxed skin tension lines tend to run perpendicular to underlying musculature and fall within real or anticipated rhytides or furrows or at the junction of cosmetic units. At some locations, such as the temple–forehead junction or central forehead, relaxed skin tension lines may be more ambiguous. In those locations, pinching of the skin to determine the greatest laxity may be helpful, as well as considering the location of nearby adjacent free margins and anatomical landmarks. In addition, as incisions approach free margins such as the eyelid, alar rim, and vermilion border, the direction of the incision should become more perpendicular to the margin to avoid distortion of the free margin.

When a surgical defect is closed in a side-to-side fashion, tissue redundancy may develop at the poles of the incision. This redundancy may be long-lasting and is usually resolved with the excision of a "dog ear."

Excision of **dog ears** (also referred to as **tricones** or **standing cones**) involves the removal of excessive tissue and placement of the incision within a favorable location, such as RSTL or the junction of cosmetic units or subunits. In advancement flaps, dog-ear excisions can be placed at the base of the pedicle or along the length of the incision line, breaking up an incision line and making it less noticeable. Excision of tricones in advancement flaps also facilitates movement of the flaps by decreasing restraining forces on movement into the surgical defect. Transposition and rotation flaps may develop dog ears at the point of rotation or transposition. In these instances, the dog-ear excision should angle away from the flap pedicle to avoid jeopardizing the blood supply to the flap.

Most of the local flaps described in this book with the exception of the paramedian forehead flap are **random pattern flaps**. They are not based on the blood supply of a single named vessel, but rather by the rich subdermal plexus that runs horizontally through the subcutaneous tissue just deep to the reticular dermis. **Axial pattern flaps** such as the paramedian forehead flap are dependent upon proper design and execution to include the named artery, but when properly performed, they provide a large well-vascularized flap for reconstruction.

For defects that extend to underlying bone or cartilage, a well-vascularized flap may be necessary for satisfactory wound healing. This is particularly true for defects where the periosteum or perichondrium is missing. In these cases, grafts frequently will not survive, and second intention healing may be significantly delayed or unsuccessful. However, with proper wound care, many significant surgical defects with exposed cartilage or bone (but intact perichondrium or periosteum) will develop granulation tissue and ultimately heal. One key requirement is patient education and proper wound care (see Section 1.7). Still, the best option for reliable and rapid wound healing on a wound with exposed or missing periosteum or perichondrium is to cover the wound with well-vascularized tissue (i.e., flap or side-to-side repair).

1.3 PATIENT CONSIDERATIONS

One of the most important elements of successful reconstruction is providing proper informed consent. The patient needs to be aware of the techniques, risks, benefits, and alternatives to treatment, and some patients may require a fairly long and detailed discussion about what their options

are in regard to various types of repair. The patient should understand what to expect in the days following repair as well as the time frame for scar maturation and improvement. In some cases, a full-thickness skin graft may be a better alternative than a local flap just because the patient will not tolerate additional incisions (and thus additional scars) created by a local flap (Sections 4.4 and 5.6). In other words, do not try to convince or "sell" a particular repair as being superior. Advise the patient of your plan for reconstruction, but if he or she is resistant to the idea, discuss and be prepared to modify. For a particular patient, the additional incisions (which result in additional scars) required for a flap repair may be more problematic than the potential benefits of a flap over a graft for specific defects (e.g., reconstruct depth as well as surface, more similar color/texture/actinic damage). Similarly, do not try to convince your patient that you are the best person to perform the repair, and never overstate your training, title, or experience. At the end of the day, it is the patient's decision or choice. If the patient prefers to have another doctor perform the reconstruction, great! In situations where a patient prefers another physician or specialty to perform the reconstruction, we can coordinate with that doctor's office so that once we have completed Mohs surgery (if that is what the patient wants), the patient travels to the other doctor's office or surgery center for repair. Remember, in 5 years, the patient will have a scar at the site of the surgery no matter who performs the repair. It may be the most beautiful scar ever, barely perceptible. But if the patient thinks that another doctor or another specialty would create a better, less noticeable scar, they may be unsatisfied with the results, and in the end, one should aim to have patients satisfied with their result and to perform surgery on patients who think that you are the absolute best person to be performing their surgery.

1.4 DESIGN OF REPAIR

The repair should be designed and marked while the patient is sitting up. Gravity has an effect upon rhytides, folds, furrows, jowls, and free margins. The exception to this rule may be for surgical defects involving the nose or the ear. Gravity has less effect on these cosmetic units, and most repairs in these areas can be marked out with the patient supine. Similarly, for defects on the lip, mark out the vermilion border before injecting local anesthetic, which can blur the vermilion border and blanch out the vermilion itself.

Orient and close the wound within **RSTL**, or in younger patients in the direction of *expected or anticipated* RSTL. RSTL tend to run perpendicular to the underlying musculature, and placement of incisions within RSTL helps to hide incisions and minimize spread or widening of the scar **(see Fig. 1.1)**. Another option is to place the incision at the junction between cosmetic units or, when that is impossible, at the junction between two cosmetic subunits. Cosmetic units of the face include the nose, lips, ears, eyelids, cheeks, chin, temple, and forehead, whereas cosmetic subunits tend to be slightly more subtle. For example, cosmetic subunits of the nose include the nasal tip, ala, sidewall, dorsum, and root; and cosmetic subunits of the lips include the upper lateral lip, philtrum, lower lip, and vermilion.

When designing the repair, consider the location of adjacent lax or loose tissue from which to borrow. Design the repair in such a way that this adjacent lax tissue is transferred to where it is needed, namely, the surgical defect. This is the principle at play in reconstruction with flaps as well as adjacent-tissue skin grafts (also known as Burows' grafts). One needs to consider how to borrow this tissue for reconstruction without distortion of nearby anatomical landmarks or free margins. This might entail choosing between a rotation flap and a transposition flap or deciding whether to use a rhombic transposition flap versus a bilobed transposition flap. If the defect involves more than one cosmetic unit (e.g., nasal sidewall extending onto the medial cheek), consider reconstructing each cosmetic unit separately. Flaps or repairs that bridge one cosmetic unit to another are more noticeable than repairs completed separately. It is the same situation if the defect extends from one cosmetic subunit to another or from a convex to a concave area. Attempt to reconstruct these areas separately if possible. If other suitable repair options exist, try to avoid the use of flaps in concave areas, where there is a higher risk of **trapdooring** or **pincushioning** of the flap. (Pincushioning occurs when scar contracture occurs beneath the flap, causing the flap to bulge outward.) However, if a flap is utilized over a concave area, the patient should be made aware that there is a higher chance of surgical revision or need for intralesional steroids in the future. In fact, it is good practice to make certain the patient is aware that there is **always** the possibility of revisional surgery, dermabrasion, or intralesional steroids irrespective of the type of repair completed. The vast majority of patients will not require further touching up, but those that may benefit will feel better if they are advised in advance that their result is a "work in progress" and the doctor has plans

for improving the final result.

1.5 SURGICAL TECHNIQUE

All procedures are done under sterile technique, utilizing a surgical scrub, sterile drapes, instruments, and gloves. Although some have advocated that sterile gloves are not necessary for many of these repairs, my bias is to recommend that anytime suture is buried (e.g., buried vertical mattress sutures), one should do whatever is necessary to decrease the risk of infection, including using sterile rather than clean gloves.

A good surgical assistant is the most useful instrument adjacent to your surgical tray, but a bad or inexperienced or poorly trained assistant can be very dangerous and increase the risk of sharp injury to yourself or the patient. A well-trained team works together like two dancers or two ice skaters performing a routine, each knowing their role and anticipating the other's movements. To minimize the risk of sharp injury, one may delegate jobs that the assistant can or cannot do. For example, in our practice, the assistant will hold the skin hook when presented to him or her by the surgeon, but will not reattach the hook to the skin if it slips free. That is the task of the surgeon. Other similar tasks include deciding who will reach for instruments, how instruments will be passed, injection of anesthetic, and loading of the suture needle onto a needle holder. There is no one correct answer, but the members of the team should know what tasks each is responsible for performing.

Tissue should be handled gently. Forceps, even toothed or tissue forceps, can easily crush tissue, especially the skin edge, resulting in a suboptimal final cosmetic result. Forceps may be used, but tissue should be handled carefully and the use of a skin hook considered whenever possible. The same can be said for the use of the cautery. The point is to use light spot electrocautery to seal blood vessels, not barbecue the wound base and edges. Too much electrocautery and too much char leaves devitalized tissue in the wound, increasing the risk of infection and delay in healing. Bleeding not stopped with light spot electrodesiccation can be surgically ligated with an absorbable suture material.

Various suture materials and suturing techniques exist depending upon the job at hand, but choice of suture material is a passionate, almost religious, choice among surgeons, and rarely is there a "correct" answer. The

author’s personal preference is to use a 4-0 polyglactin 910 **buried** absorbable suture material for most facial repairs (5-0 polyglactin 910 for eyelid lesions) and 6-0 polypropylene nonabsorbable suture material for **percutaneous** sutures. Vertical mattress sutures add strength to a wound and are helpful when one wishes to hyperevert the wound edges (e.g., over the helical rim or at the eyelid margin). Simple interrupted and running percutaneous sutures are frequently interchangeable. The main benefit of a running suture is that the repair can be performed significantly faster. In contrast, the appearance of neat, uniform simple interrupted sutures lined up in a row with evenly trimmed suture ends may provide a mindset to a particularly fastidious patient concerned about a surgical scar that the surgeon performed a meticulous repair and the resulting scar will be superb (Sections 3.1 and 4.1). Remember, the patient’s perception of the scar is based on hard facts like length, width, hypertrophy, and color as well as softer beliefs. These softer beliefs or convictions may include the notion that the surgeon took his or her time and did a good job and that the surgeon was the best specialist or the best doctor to perform the repair. In those patients, you want to do everything possible to make sure that the patient’s beliefs are supported by what they see every day in the mirror while caring for the surgery site.

And to perform a meticulously executed repair it is necessary to have adequate lighting and magnification. In my opinion, every aspect of reconstruction is **easier** with good surgical lighting and magnification, especially details like light spot electrodesiccation and suture placement. Similarly, a good reliable adjustable surgical table and especially top-quality surgical instruments make a huge difference in ease of repair. Do your back and neck a favor and use an adjustable surgical table at the proper height for your repairs. Do your patient a favor, and especially the tissue that you will be handling, and use high-quality surgical instruments in your repair. There is a huge difference between poorly constructed and top-quality instruments, but as with suture choice, many surgeons express an almost religious fervor about their particular favorite brand of surgical instruments.

1.6 EXECUTION OF REPAIR

In the author’s opinion, the best chance of avoiding surgical complications including postoperative infection is to perform the procedure with sterile skin surgical preparation (e.g., chlorhexidine gluconate or iodophor),

sterile drapes, and sterile gloves. This is particularly important for complicated repairs, such as local flaps, and when sutures are buried beneath the skin surface. Although some may advocate that clean (but not sterile) gloves are adequate for most aspects of facial reconstruction, the author believes that decreasing the local population of potentially infectious organisms may help to minimize complications such as infection or suture extrusion.

All procedures described in this text are performed with the use of local anesthesia only, except where an oral anxiolytic (e.g., diazepam) may be added preoperatively. Lidocaine is used as the local anesthetic agent except in cases where patients described a history of allergy to lidocaine. In those instances, an alternative anesthetic is used. For surgical cases of longer duration, such as melanoma cases where immunostains are employed, bupivacaine is also used to extend the duration of anesthesia. Whenever possible, a local anesthetic with epinephrine (e.g., 1% lidocaine with epinephrine) is the preferred agent because the local use of epinephrine causes vasoconstriction, helping to limit bleeding and also prolong the anesthetic effect. However, the use of epinephrine in certain areas (e.g., digits and penis) is controversial because of the concern that ischemia or necrosis could develop. In those instances, lidocaine without epinephrine may be employed.

The cases illustrated are performed following Mohs micrographic surgery. For repairs performed following Mohs surgery or referred by another physician, the edges of the wound should be debevelled or trimmed so that the edges of the wound are clean and not angled. Most flaps are undermined by blunt dissection before incising the flap itself except for larger repairs. By undermining first, subsequent incision of the flap remains at a consistent and appropriate level. After incising the flap, additional blunt and sharp dissection is performed to mobilize the flap as necessary. The level of undermining may vary depending on location. Most undermining on the nose is in a submuscular plane, whereas undermining on the forehead or cheek is usually in a subcutaneous location.

Closure for repairs illustrated in this book is done with layered repairs. First, the surgical defect is closed with buried sutures, usually buried vertical mattress sutures. These buried vertical mattress sutures are flask shaped and have a tendency to approximate and evert the wound edges.

Everting the wound edge, whenever possible, provides a superior cosmetic result because as the scar matures, it contracts, and the scar flattens. A wound that starts flat may end up being slightly depressed. This creates shadows and may make the scar more conspicuous. Another point about closure of repairs—and probably the most important point to remember for repairs with transposition flaps—is that if you are performing a transposition flap (e.g., rhombic, bilobed, melolabial), **always** close the secondary defect first. More on that point in our descriptions of flaps at specific locations later, but suffice it to say that closure of the secondary defect in transposition flaps should **always** be done first.

Once wound edges are approximated and everted, the skin edges are closed with a finer-caliber nonabsorbable suture. For most of these repairs, 4-0 polyglactin 910 suture is used for buried sutures, and 6-0 polypropylene for percutaneous sutures. Many of the cases illustrated show 6-0 polypropylene simple interrupted sutures, although many surgeons will use a running percutaneous suture instead. As mentioned earlier, the main benefit of a running suture is the time saved, whereas there are two potential benefits to using simple interrupted sutures. The first benefit is to more carefully approximate each suture at each location along the incision, and any swelling is not transmitted down the entire incision length of the suture material. The second benefit from, and the main reason for, using simple interrupted sutures frequently is that it looks better to the patient. The neat, regular, meticulous appearance of these sutures creates a powerful expectation in the patient that the final result of the scar will be superior. After all, patients take all sorts of factors into account in determining whether someone is a good doctor or whether the final scar is acceptable. Aside from factors previously described, these factors may include many components completely separate from the surgeon or the surgery, such as employee phone etiquette, reception by staff, organization and appearance of entry and waiting rooms, and professionalism of nursing and front office staff. So especially for central facial defects, where the incision and repair is most easily seen, and especially in more fastidious patients, who may be more concerned about the final appearance of the scar, the preference is to use a lot of small, uniform, neatly cut simple interrupted sutures.

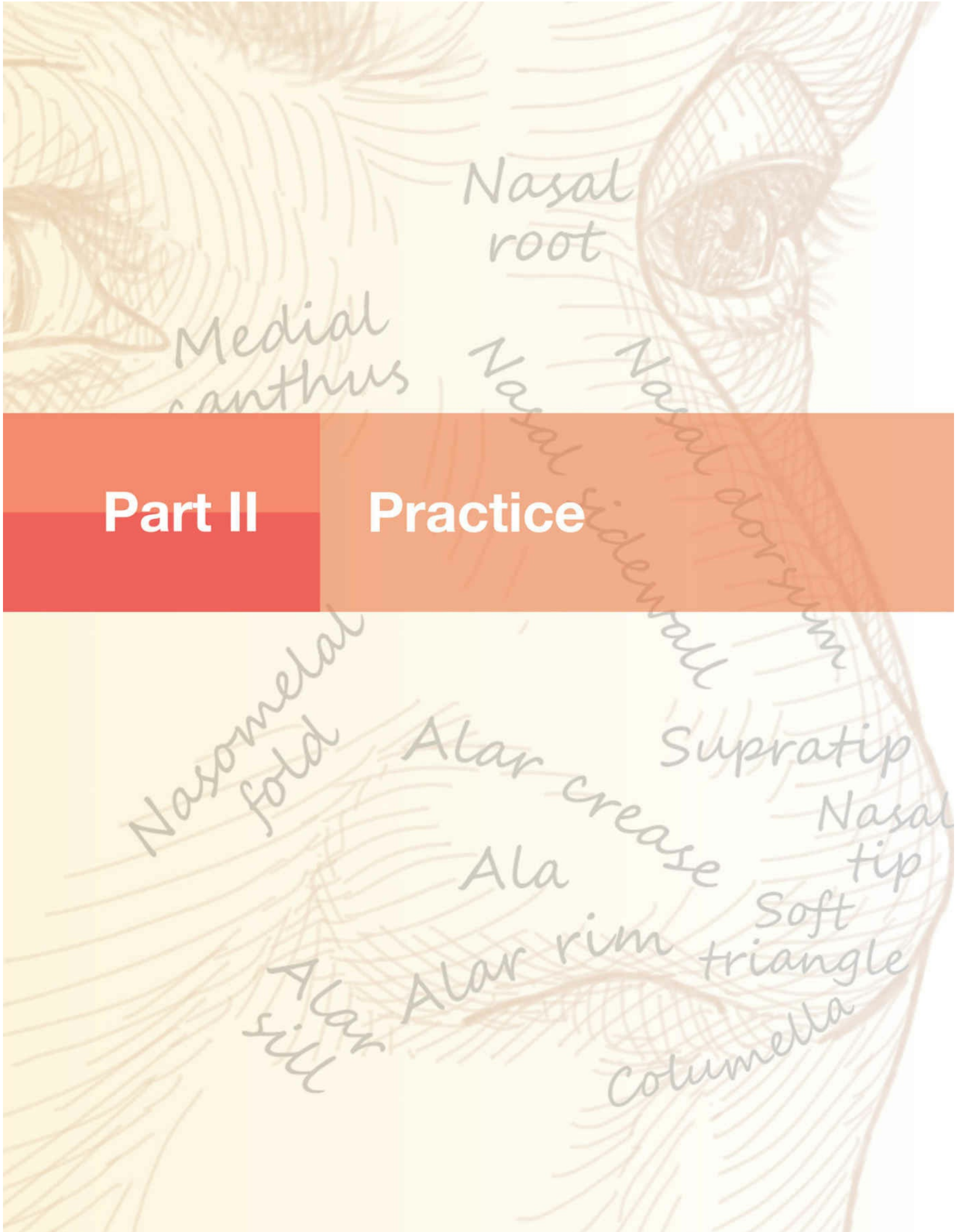
The final thing to consider regarding “execution of repair” could have been the first: perform the repair in the order that makes the most sense. One would not perform the finished carpentry or cabinet work in building

a house before pouring the foundation or framing the walls. The same holds true for repairing a surgical wound. Start with the design, follow with structure (support if necessary) and larger procedures (e.g., undermining and incisions), and finish with the detail work (e.g., trimming flap, removing tricones, final sutures). Moving in this order makes for the greatest likelihood of success.

1.7 WOUND CARE

Proper wound care for second intention healing sites and for postreconstruction sites is usually similar. The patients are instructed to keep the wound clean, moist, and covered. Pressure bandages are usually applied for the first 24 hours after surgery to decrease the risk of bleeding. Ice or cold packs are applied over the bandage and adjacent area for 15 minutes each hour while awake for the first 24 to 48 hours. Starting 1 day postop, the patient cleans the wound with soap and water or with hydrogen peroxide. (Hydrogen peroxide is not used over areas where wound healing may be more difficult, such as wounds with exposed cartilage or bone or open wounds on the lower extremities.) After cleaning the wound, a liberal amount of bland ointment (e.g., petrolatum) is applied to the wound and a nonadherent bandage applied and held in place with paper tape. This regimen is performed twice daily until the sutures are removed and steri-strips applied (or until reepithelialization is complete in second intention wounds). After the steri-strips fall off, the patient may use a silicone-based gel and sunscreen on the incision site until the final cosmetic result is reached, at usually 6 to 12 months.

Part II Practice



2 Practical Aspects of Facial Reconstruction

The practical goal of facial reconstruction is to provide the most aesthetic and functional repair possible, striving to meet or exceed the patient's expectations. The goal is to restore the appearance and function to a point in time before the patient developed skin cancer and required Mohs or excisional surgery. Unfortunately, surgery to remove the cancer and to repair the surgical defect creates scars. The successful reconstructive surgeon minimizes scars through a number of techniques, such as closure at the junction of cosmetic units or subunits, avoidance of deviation of free margins and anatomical landmarks, and reconstruction with tissue of similar color and texture. Above all, take the patient's expectations into account. Some patients will prefer the simplest option possible, which may be second intention healing, whereas others may be particularly meticulous and require a more exacting reconstruction. In some instances, patients may be resistant to a flap repair as additional incisions must be made to create and mobilize the flap. In these instances, although a flap repair might provide a superior cosmetic or functional result for most patients, a graft repair or second intention healing may be preferable because no additional or iatrogenic incisions and scars are created by the surgeon. Discuss the repair with the patient before surgery, and be open to adjust or change your planned repair on the basis of the patient's input.

2.1 SECOND INTENTION HEALING

Second intention healing may be an excellent alternative for select defects. For surgical defects on concave areas, repair by second intention healing offers a simple and attractive repair option **(Fig. 2.1A)**. Large defects on the concave surface of the temple heal well by second intention healing so long as the defect is not too close to a free margin or anatomical landmark (Section 4.8). In these situations, where the defect may be close to the eyebrow, lateral canthus, or eyelid, a graft or partial closure repair near the free margin may be used to minimize scar contracture and avoid free

margin or anatomical landmark deviation (Section 8.6).

For defects in the conchal bowl of the ear that do not approach the external auditory meatus (EAM), second intention healing may be an excellent choice for repair (Section 7.4). For defects involving a majority of the EAM or risk constriction of the EAM, a full-thickness skin graft, preauricular transposition flap or postauricular pull-through flap may be a better alternative to speed healing and minimize narrowing of the meatus (Sections 7.3 and 7.5); however, if the defect involves only a small portion of the EAM, second intention healing may still be considered.

In other facial regions, superficial defects on concave surfaces of the nose (e.g., alar crease) and eyes (e.g., medial canthus) may heal well by second intention healing **(Figs. 2.1A–E)**.

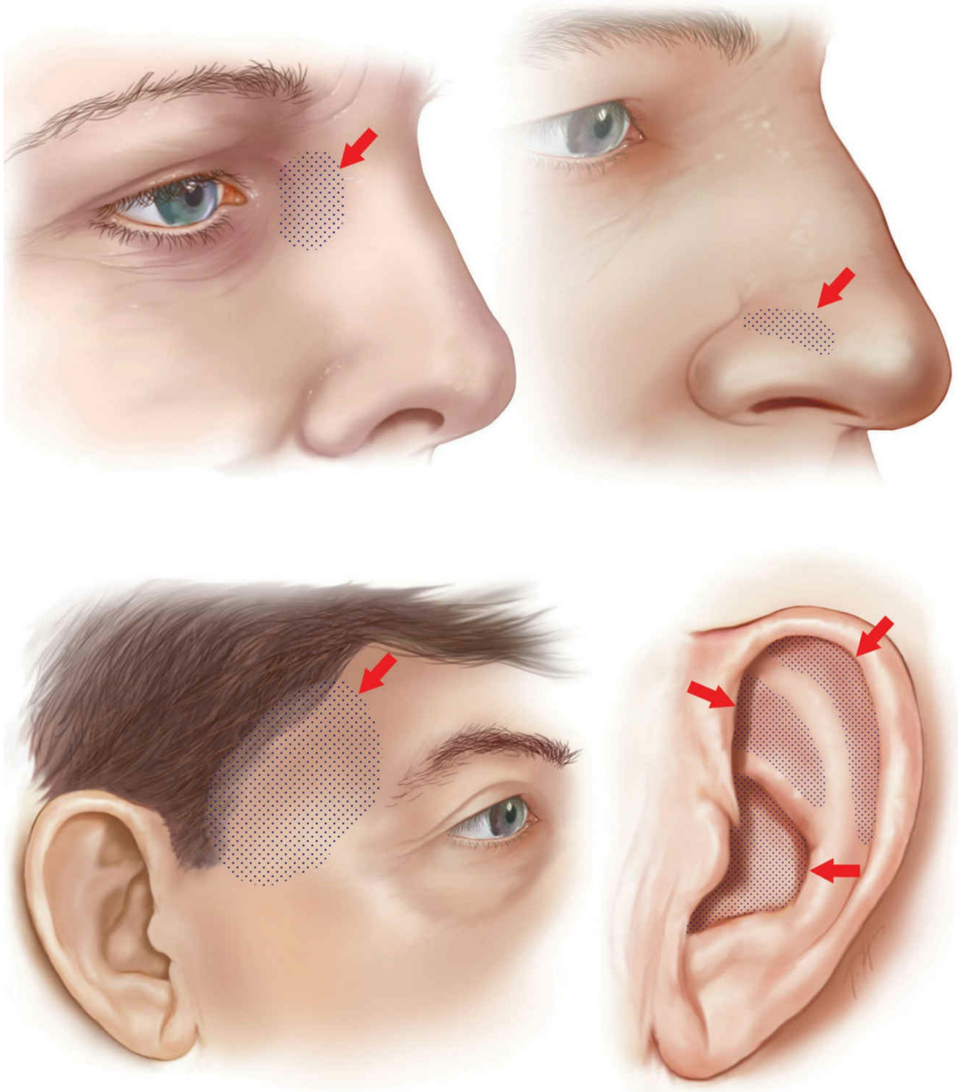


Figure 2.1A. Surgical defects on concave areas of the head may heal well by

second intention healing. The diagram demonstrates stippled areas in various locations where second intention healing may be a good consideration. This may include superficial concave areas of the ear, nose, medial canthus, and temple. If a defect involves or approximates an anatomical landmark or free margin, consider repair or partial repair to avoid deviation of the landmark or margin.

Figure 2.1B. Superficial defect on the right medial canthus measures approximately 1.1 × 0.7 cm. Patient wanted to avoid additional scars and desired simplest repair.

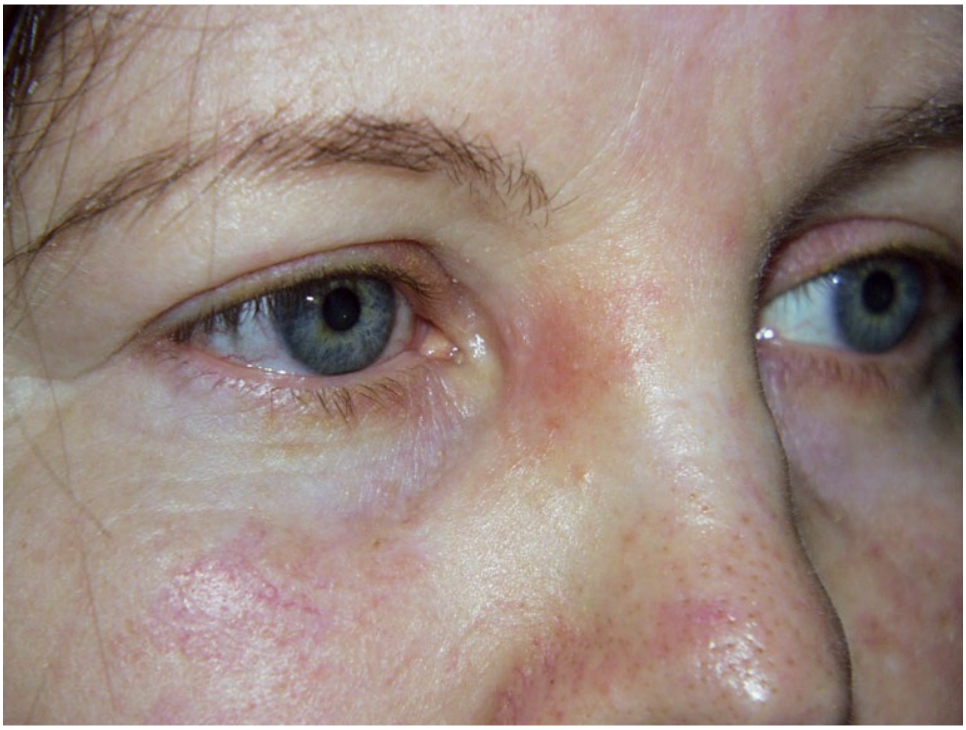


Figure 2.1C. Healed result at 3 months after allowing the wound to heal by second intention healing.

Figure 2.1D. Superficial wound on the right alar crease and another smaller wound on the posterior aspect of the nasal ala.

Figure 2.1E. Healed appearance following second intention healing. (Defect on posterior nasal ala was also allowed to heal by second intention healing as it was in relatively concealed location.)

2.2 SIDE-TO-SIDE REPAIR

Next to second intention healing, the simplest repair is a side-to-side repair. If the defect is elliptical in shape, the wound can be closed without the removal of tissue redundancy, usually referred to as a **tricone, standing cone, or "dog ear."** Conversely, most defects in skin cancer surgery tend to be oval, circular, or irregular in shape. As a result, most side-to-side repairs entail removal of one or more dog ears, usually at the poles of the closure, although removal of these dog ears may be designed to occur elsewhere along the incision or angled in a particular direction

(Figs. 2.2A–D).

To increase the chance of producing an incision and thus a scar that remains fine and well hidden, the wound should be closed along **relaxed skin tension lines (RSTL)** whenever possible. The RSTL tend to run perpendicular to underlying musculature and fall within real or anticipated rhytides or furrows (see **Fig. 1.1**).

Through closure of the defect and removal of the dog ears, the final length of the incision and scar is lengthened. In general, the length of the closure (i.e., the length of an elliptical excision) is roughly three times the width of the closure (i.e., the width of the ellipse); however, this ratio can be increased to 4:1 or greater when the closure is over a convex surface (e.g., convex portion of the cheek or around the forearm) (Section 3.1). A key point is to discuss and explain this to the patient in advance of the repair. Most people understand and appreciate the concept of lengthening the repair, removing the dog ears, placement within RSTL, especially when explained in advance of the repair. Better to educate in advance rather than try to justify later.

Figure 2.2A. Surgical defect on the right cheek.

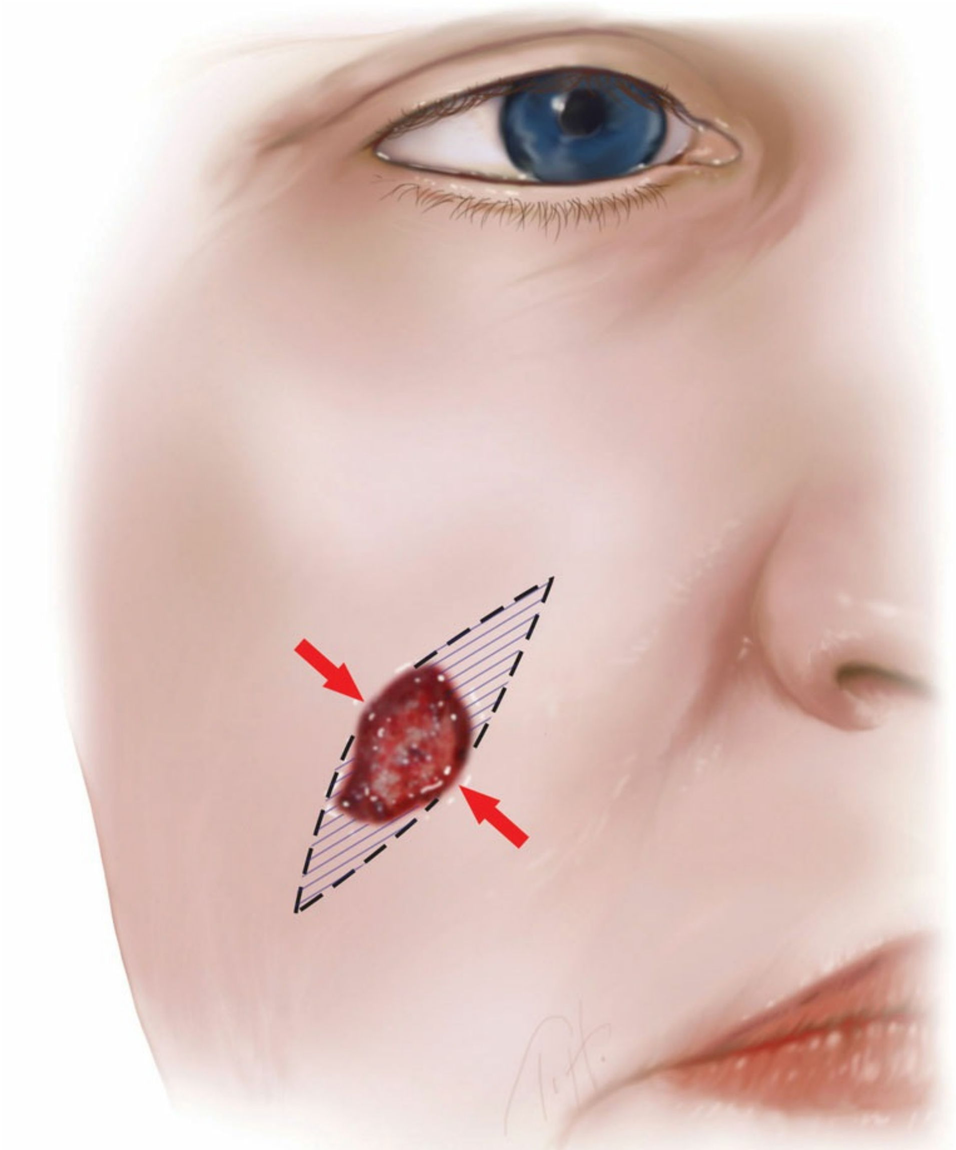


Figure 2.2B. Design of the side-to-side repair. The wound is closed in the direction of relaxed skin tension lines (see also **Fig. 1.1**). Two tricones or standing cones ("dog ears") are excised at the poles of the defect, creating an ellipse that measures approximately 3:1 length to width ratio.

Figure 2.2C. Wound closed in a side-to-side fashion along relaxed skin tension lines with excision of tricones. (Wound closed with 4-0 polyglactin 910 buried vertical mattress sutures and epidermis approximated and everted with 6-0 polypropylene simple interrupted sutures.)

Figure 2.2D. Final healed result. (Telangiectasias present preoperatively as well and could be treated with pulsed dye laser.)

For side-to-side repairs approaching a free margin or anatomical landmark, consider changing the direction of the dog ear excision. In other words, remain within RSTL whenever possible but not at the expense of deviating the free margin or anatomical landmark. For example, for lower eyelid defects that can be closed in a side-to-side fashion, as you approach the lid margin, you might have to redirect the incision line upward (rather than remaining within the fine lines on the eyelid skin) and end up more perpendicular to the lid margin to avoid secondary tension vectors, which might result in ectropion.

2.3 ADVANCEMENT FLAPS

Although advancement flaps permit slightly more tissue movement than side-to-side repair, one of their main benefits is to allow the placement of incision lines and tricones (dog ears) in more favorable positions **(Figs. 2.3A–D)**. Doing this helps advancement flaps to recruit an additional amount of tissue laxity in comparison with side-to-side repair (Section 5.2). Another benefit of moving incision lines and tricones is the avoidance of violating free margins or boundaries (e.g., crossing the alar crease when repairing the sidewall) or of crossing into another cosmetic unit or subunit (e.g., crossing into the nasal tip when repairing the nasal dorsum).

The closure tension vectors remain parallel to the primary motion of the flap so there is little or no tension redirection, but in some instances, a unilateral or bilateral advancement flap may offer distinct advantages over other types of flaps (e.g., transposition). These may include repairs on the forehead or midnasal dorsum for defects too large to be easily closed in a side-to-side fashion (Sections 4.6 and 5.2). In these instances, it may be preferable to consider a repair that borrows tissue laxity bilaterally, in essence sharing donor sites symmetrically. Although a rhombic or bilobed transposition flap may be able to repair a defect on the midnasal dorsum, it borrows tissue from just one side of the nose. The result may be nasal asymmetry when the patient is viewed from the front because tissue from only one side is borrowed. With a bilateral repair, tissue is borrowed from both sides, creating a slightly thinner but symmetrical nose.

Figure 2.3A. Two surgical defects on the left supraorbital forehead.

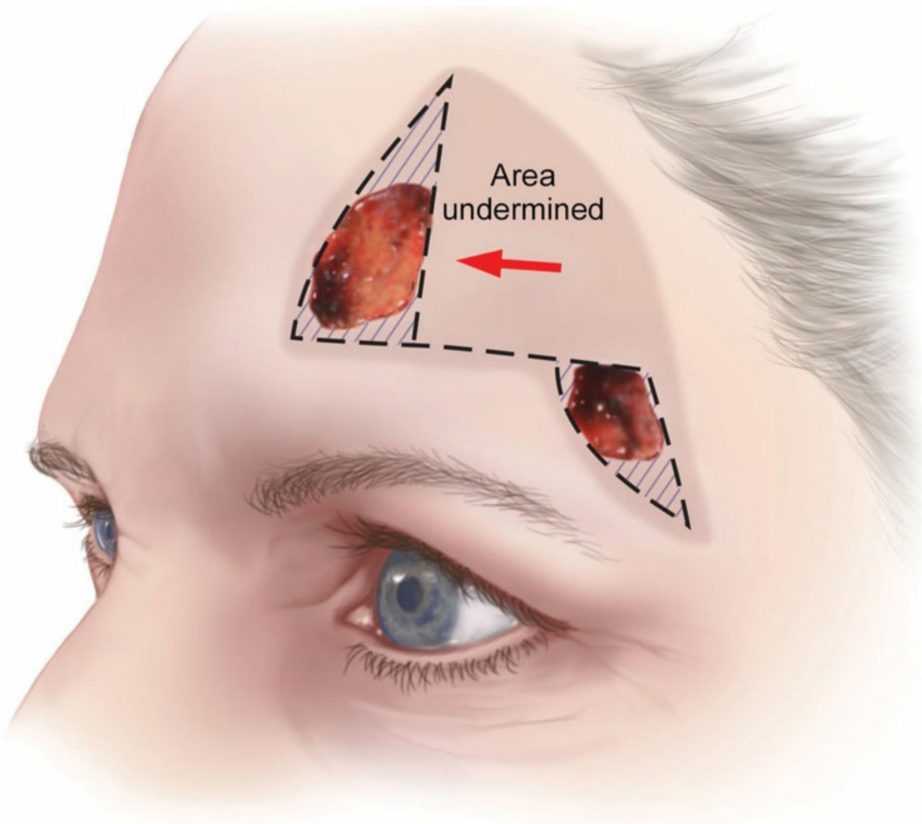


Figure 2.3B. Most of the loose or lax tissue available for repair is on the lateral forehead or temple. By itself, the larger, medial defect would likely be repaired

with an advancement flap to recruit additional tissue laterally and avoid crossing into the eyebrow (both possibilities with a side-to-side repair). The flap was designed so that the tricone excision would incorporate the second surgical defect.

Figure 2.3C. Advancement flap sutured into place. By recruiting tissue laterally, eyebrow position is not disturbed.

Figure 2.3D. Final healed cosmetic result.

2.4 ROTATION FLAPS

Rotation flaps may be useful for facial reconstruction in selected cases, especially on the cheek, nose, and scalp. Compared with transposition flaps, rotation flaps may be better able to place incision lines at more favorable locations for repair of larger defects or defects near free margins or anatomical landmarks (e.g., placement at cosmetic unit junctions, RSTL). Some key points to consider in design of the flap are its length, arc or rotation, and need for a back cut.

Rotation flaps redistribute some or all of the closure tension vectors from the primary surgical defect to a secondary defect located along the **length** of the rotation flap. In general, a longer flap creates a narrower and easier-to-close secondary defect.

As the flap rotates into the surgical defect, the wound closure vectors change. The greater the rotation, the greater the redirection of closure tension vectors. Most rotation flaps have an **arc of rotation** of less than 90 degrees or a quarter of a circle. Larger arcs of rotation permit even greater movement, but have the potential to produce unfavorable secondary tension vectors that work against primary flap movement. Also, as the flap rotates into the surgical defect, it shortens, but this can be compensated by increasing the flap length, the arc of rotation, or the offset of the flap (i.e., location on surgical defect where flap begins).

Finally, to minimize pullback or residual tension at the leading edge of the flap, wide undermining of the flap and surrounding tissue is necessary in addition to either a **back cut** or dog ear excision at the distal aspect of the flap **(Figs. 2.4A–D)**. Like a larger arc of rotation, a back cut may decrease flap restraint and facilitate movement, but it cuts into the vascular pedicle, and subsequent closure of the back cut may work against the primary motion of the flap. The author prefers to use a tricone excision outside of the pedicle, which serves the same purpose without potentially compromising the pedicle or creating adverse secondary tension vectors. Several of the rotation flaps in this text use wide undermining and dog ear excision to help mobilize the flap (Sections 3.7, 4.5, and 5.5).

Summarizing, in design and execution of a rotation flap, consider a long, slowly arcing incision with wide undermining of the flap and surrounding tissues with a dog ear excision or back cut at the distal aspect of the flap. Try to place your incisions (and dog ear excisions when possible) at the junction of cosmetic units and secure and suture your flap to take full advantage of the redirection of closure tension vectors (Sections 3.7 and 4.5).


Figure 2.4A. Surgical defect on the left temporal scalp.

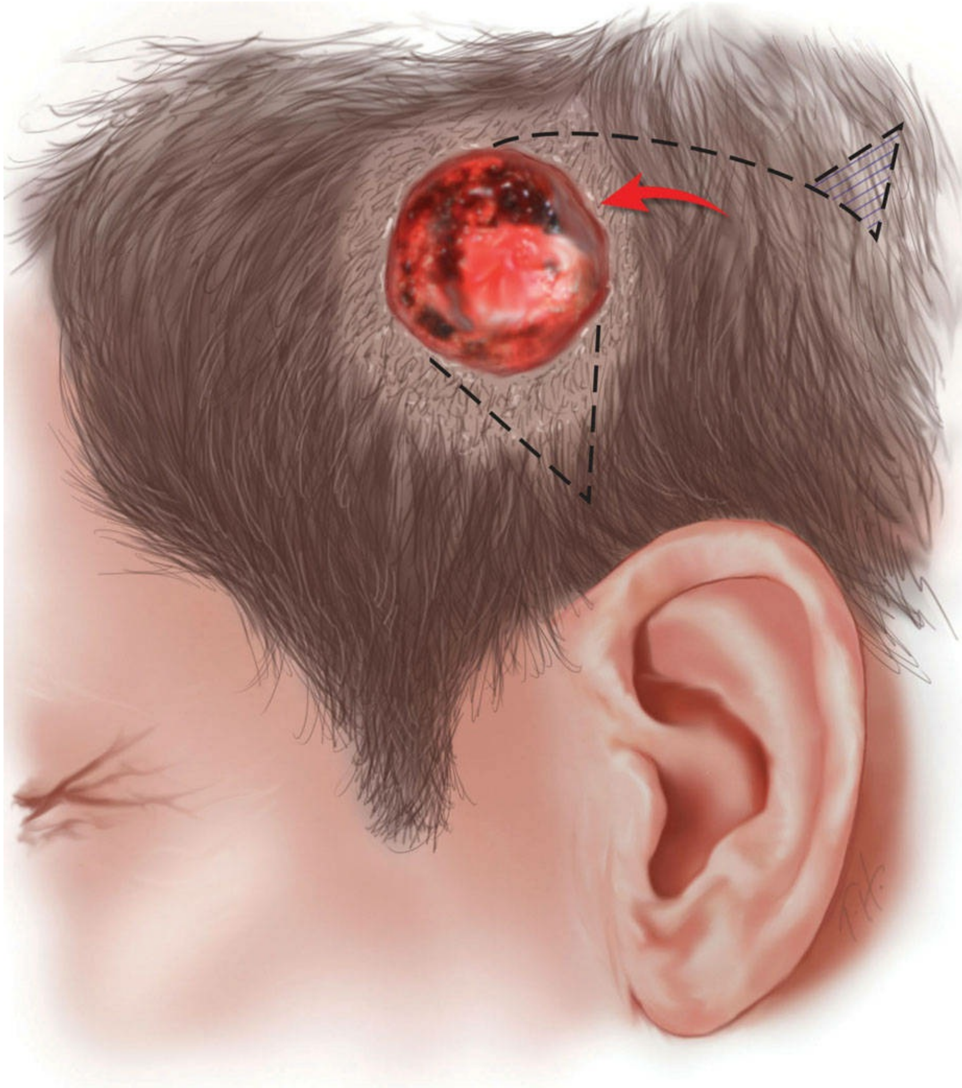


Figure 2.4B. Design of the rotation flap. The arc of rotation is less than 90 degrees in this example. An arciform incision is designed with excision of a tricone or incorporation of a back cut at the distal edge. Incision into the skin follows the direction of hair follicle growth to decrease transection of follicles and approximate hair-bearing skin to hair-bearing skin. The flap and surrounding skin are undermined widely, and the flap is sutured into place after excision of a tricone at the point of rotation. The scalp flap is secured with 3-0 polyglactin 910 sutures and wound edges approximated with 4-0 or 5-0 polypropylene running percutaneous suture (keeping suture high or superficial in the skin to minimize trauma to hair follicles). The initial buried sutures should secure the flap into the surgical defect (i.e. close the surgical defect first in rotation flaps), and subsequent sutures are used to close the secondary defect and location of the tricone excision.

Figure 2.4C. Immediate postoperative appearance.

Figure 2.4D. Final healed appearance.

2.5 TRANSPOSITION FLAPS

Transposition flaps move tissue over intervening tissue to reach the surgical defect. As a result, these types of flaps are best able to redirect tension away from the primary surgical defect and are useful around free margins and anatomical landmarks (e.g., alar rim and nasal tip). Compared with advancement and rotation flaps, transposition flaps tend to be smaller, and the incision lines more numerous and more difficult to place at the junctions of cosmetic units or within rhytides and furrows. Transposition flaps include rhombic, bilobed, and melolabial transposition flaps **(Figs.**

2.5A–D).

One key point of advice in transposition flaps: *always close the secondary defect first!* Always! The intervening tissue between the donor site of the flap and the surgical defect helps to redirect tension away from the surgical defect, so it makes no sense to transpose the flap into the surgical defect and begin suturing there. When properly performed with the secondary defect closed first, the transposition flap should essentially "fall" into the surgical defect, mitigating potential secondary tension vectors (Sections 5.4 and 5.8-5.10).

Figure 2.5A. Surgical defect on the nasal sidewall. Most of the lax tissue is on the more proximal portion of the nose. If the surgical defect had been more posterior (i.e., closer to the cheek), another donor site would be the medial cheek, and a flap from the cheek (e.g., advancement flap) would have been a consideration.

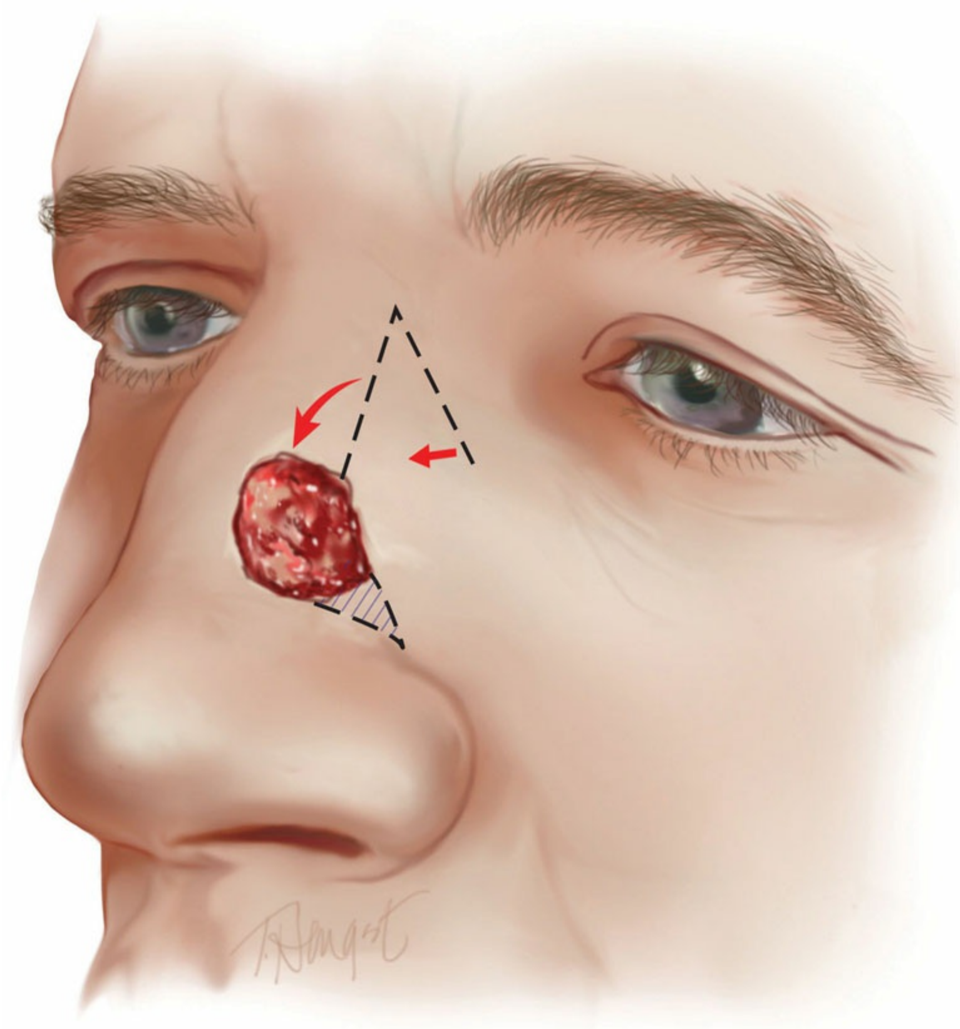


Figure 2.5B. Design of a rhombic transposition flap. Consider location of the available lax skin (i.e., proximal nasal sidewall in this case), and then consider direction of secondary-defect closure to avoid adverse tension vectors. The flap should be large enough to fill the defect, and the distal angle of the flap tip is approximately 60 degrees. If necessary, the flap and/or defect may be trimmed to fit securely, and a tricone may be excised at the point of rotation (transposition), avoiding cutting into the flap's pedicle.

Figure 2.5C. Rhombic transposition flap sutured into place. Closure of the secondary defect avoided deviation of anatomical landmarks (e.g., medial canthus) and free margins (e.g., eyelid margin). The tricone was excised in a direction angling away from the flap's pedicle.

Figure 2.5D. Final healed result. Development of new blood vessels is part of normal wound healing, and this sometimes results in new or additional telangiectasias on or around the healed flap. This can be easily treated with a pulsed dye laser, which is the same laser used for other telangiectasias, angiomas, and vascular birthmarks.

2.6 ISLAND ADVANCEMENT FLAPS

Island advancement flaps were previously referred to as island pedicle flaps, but their design does not fit the characteristics of what is currently

referred to as an island pedicle flap. Basically, island advancement flaps are advancement flaps without a cutaneous connection, an island of skin and subcutaneous tissue whose random-pattern blood supply comes only from the subcutaneous pedicle. Without the cutaneous connection, they have better mobility than a standard advancement flap **(Figs. 2.6A–D)**.

Island advancement flaps tend to be triangular in shape with a single, deep, centrally located subcutaneous pedicle. The random-pattern blood supply comes from vertically oriented perforating vessels, and the pedicle must be carefully undermined by blunt and sharp dissection at its leading and trailing edges as well as along the lateral edges to mobilize the flap while preserving its blood supply. A linear or curvilinear triangle works best where at least one long side of the triangle can be hidden within a rhytid or furrow or at the junction of two cosmetic units or subunits. The island advancement flap may be an excellent alternative in areas such as the alar sill, pretragal cheek, and nasomelal fold, where adequate tissue is available for a subcutaneous pedicle (Sections 3.3, 3.4, 5.3, and 6.4).

Figure 2.6A. Surgical defect involving the alar sill, medial cheek, and posterior aspect of the nasal ala. The defect involves separate cosmetic units (nose and cheek), and the alar sill is an anatomical landmark best described as an isthmus or peninsula of tissue that separates the nose, cheek, and lip.

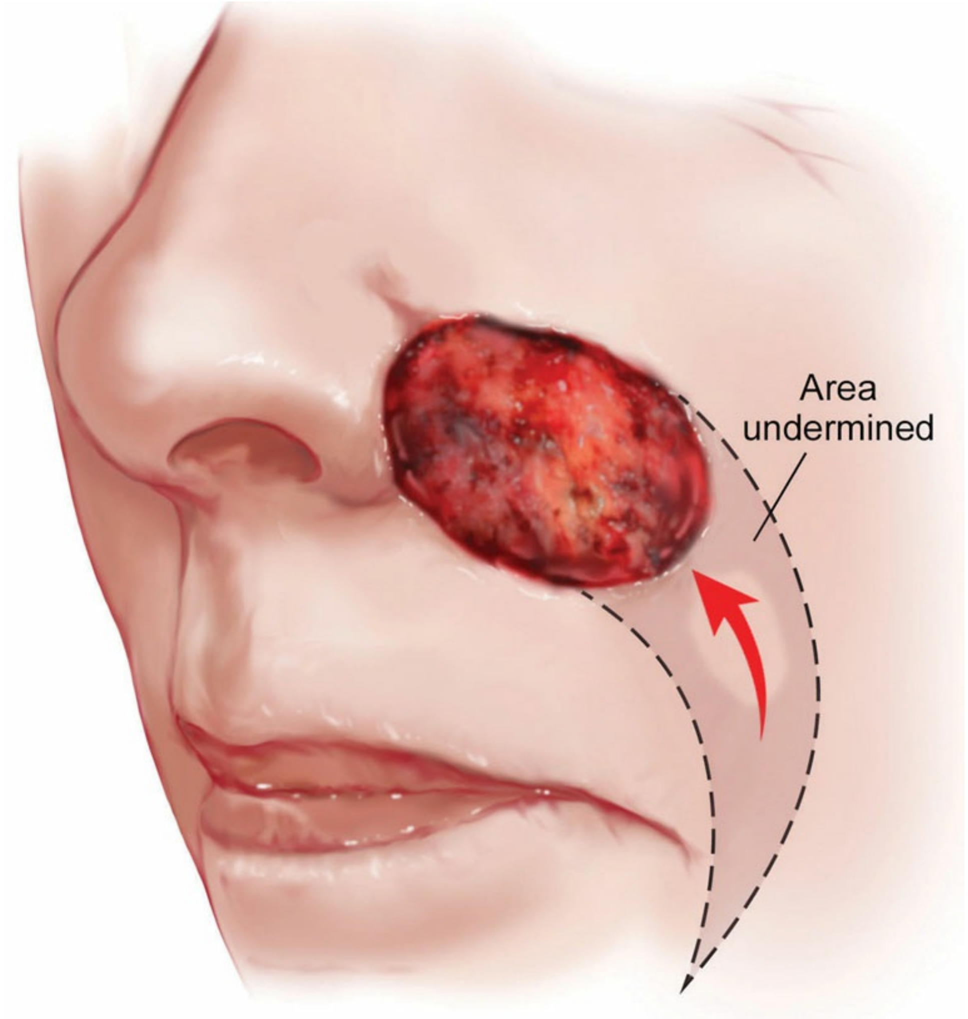


Figure 2.6B. Design of the repair. The medial cheek and alar sill are repaired with an island advancement flap. The inferior, long side of the triangular flap follows the inferior portion of the melolabial furrow past the oral commissure. After adequate mobilization, the flap is advanced into the surgical defect and thus, a portion of the incision falls outside of the melolabial furrow as it reconstructs the inferior aspect of the surgical defect in the alar sill. The flap stops at the medial border of the alar sill, where the nose attaches to this anatomical landmark. The surgical defect in the second cosmetic unit is best repaired with another repair (especially because it is located across the concave area where the nose meets the alar sill).

Figure 2.6C. Immediate postoperative appearance. The alar sill and medial cheek are repaired with an island advancement flap, but the posterior aspect of the nasal ala is repaired with a small full-thickness skin graft (donor site: small portion removed from tail end of flap). The graft and leading edge of the flap are secured downward to the wound bed, and the small intervening tissue between them is allowed to heal by second intention healing. This helps reconstruct the complex topography in this location.

Figure 2.6D. Short-term healed result. Mild erythema along incision line will resolve with time, but convexities and concavities in this area are fairly well reconstructed.

2.7 SKIN GRAFTS

Skin grafts, whether full- or split-thickness, serve a useful purpose in facial reconstruction. Although they are less able to reconstruct depth, they can provide an aesthetic reconstruction for superficial wounds **(Figs. 2.7A–C)**. As a result and because they limit scar contracture in comparison with second intention healing, grafts may be a preferred repair for superficial defects adjacent to free margins or anatomical landmarks, especially in flat

or concave areas (e.g., anterior alar crease or medial or lateral canthi; see Sections 5.6 and 8.6). At the same time, because they do not reconstruct depth well, they are less practical for more complex wounds (e.g., deep defects). One exception might be in instances where the patient or the surgeon may want to avoid the creation of additional incisions, as would be the case in design and completion of a local flap. In those instances where the patient, in particular, will not accept additional incisions and scars, a graft, may be preferable, even though a local flap may give a better color/texture/thickness match and may reconstruct depth better.

Figure 2.7A. Surgical defect on the lateral upper eyelid and temple.

Figure 2.7B. A full-thickness skin graft sutured into place. Fenestrations and tacking sutures help to minimize fluid separating the graft from the wound bed. Polypropylene sutures will help secure a tie-down dressing to the graft, helping to increase graft survival.

Figure 2.7C. Final healed view. Use of the full-thickness skin graft minimizes scar contraction, which could distort the eyelid. In addition, graft repair avoids risk of potential secondary tension vectors that could complicate flap reconstruction.

2.8 DELAYED OR STAGED INTERPOLATION FLAPS

Staged or delayed interpolation flaps are a useful alternative when local flaps or grafts are inadequate to complete an aesthetic and functional result. The history of these flaps dates back to 700 BC in India, where a caste of potters, known as Koomas, described the use of a cheek interpolation flap for nasal repair of traumatic injuries. A second flap, originating on the forehead, was subsequently described, and these two

staged flaps form some of the earliest examples of complex reconstructive surgery (see photo of wax moulage in the Front Matter of the book).

An interpolation flap is a type of transposition flap that requires a second stage to divide and inset its vascular pedicle **(Figs. 2.8A–D)**. In the first stage, the donor tissue is elevated, usually from the forehead or cheek, and transposed over intervening tissue to the surgical defect, where it is sutured into place. The blood supply within the flap's pedicle sustains the donor tissue until vascularization develops from the tissue surrounding the surgical defect. At this point, usually 3 to 4 weeks following surgery, the pedicle is severed and inset, and at the same time, the flap may be thinned and tailored to better fit and blend within the cosmetic subunit (Sections 5.11, 5.12, 6.12, and 7.9).

Figure 2.8A. Large surgical defect of the nasal tip, supratip, and dorsum extends to the underlying cartilage.

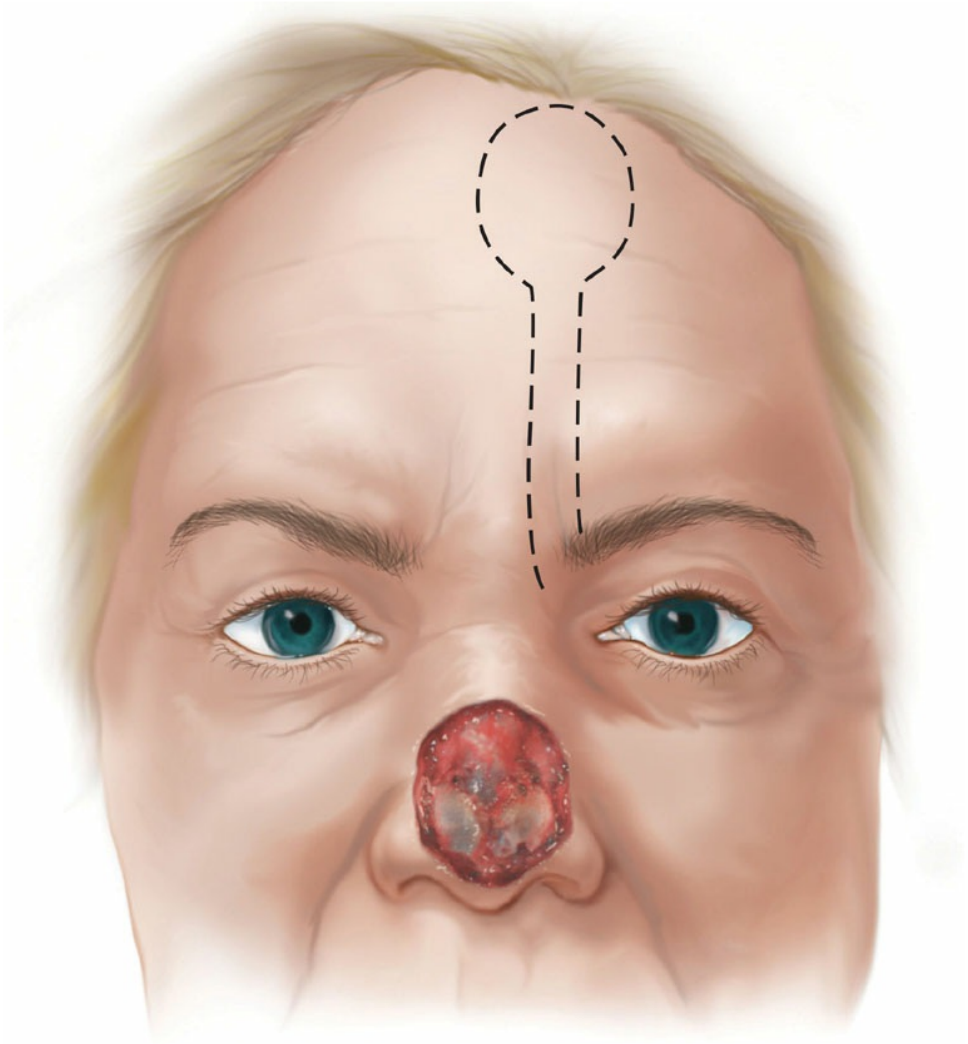


Figure 2.8B. Design of a paramedian forehead flap. A template of the surgical defect is used to design a proper-sized flap. If necessary, the defect may be enlarged so that placement of incision lines and subsequent scars occur at the junction of cosmetic units or subunits. The portion of the flap that covers the defect is very thin with just a small amount of subcutaneous fat. The pedicle of the flap is much thicker and contains the supratrochlear artery and other tributaries that provide a healthy blood supply.

Basically, staged interpolation flaps excel over local random flaps when there is inadequate local tissue to reconstruct the surgical defect without distortion or flap compromise. There is only a limited amount of tissue on the proximal two-thirds of the nose from which to borrow for repair of defects on the distal one-third of the nose. So for defects greater than 1.5 to 2.0 cm in diameter in this region or for full-thickness nasal tip or alar defects, a staged interpolation flap may be necessary because there will not be an adequate amount of local tissue available from which to borrow and complete the repair. Staged interpolation flaps, like the paramedian

forehead flap, provide a full-thickness segment of tissue suitable for repair of deep or even through-and-through defects on the distal nose. And because of a reliable and robust blood supply, interpolation flaps are particularly useful in instances where cartilage grafts are used to create structural support in reconstruction.

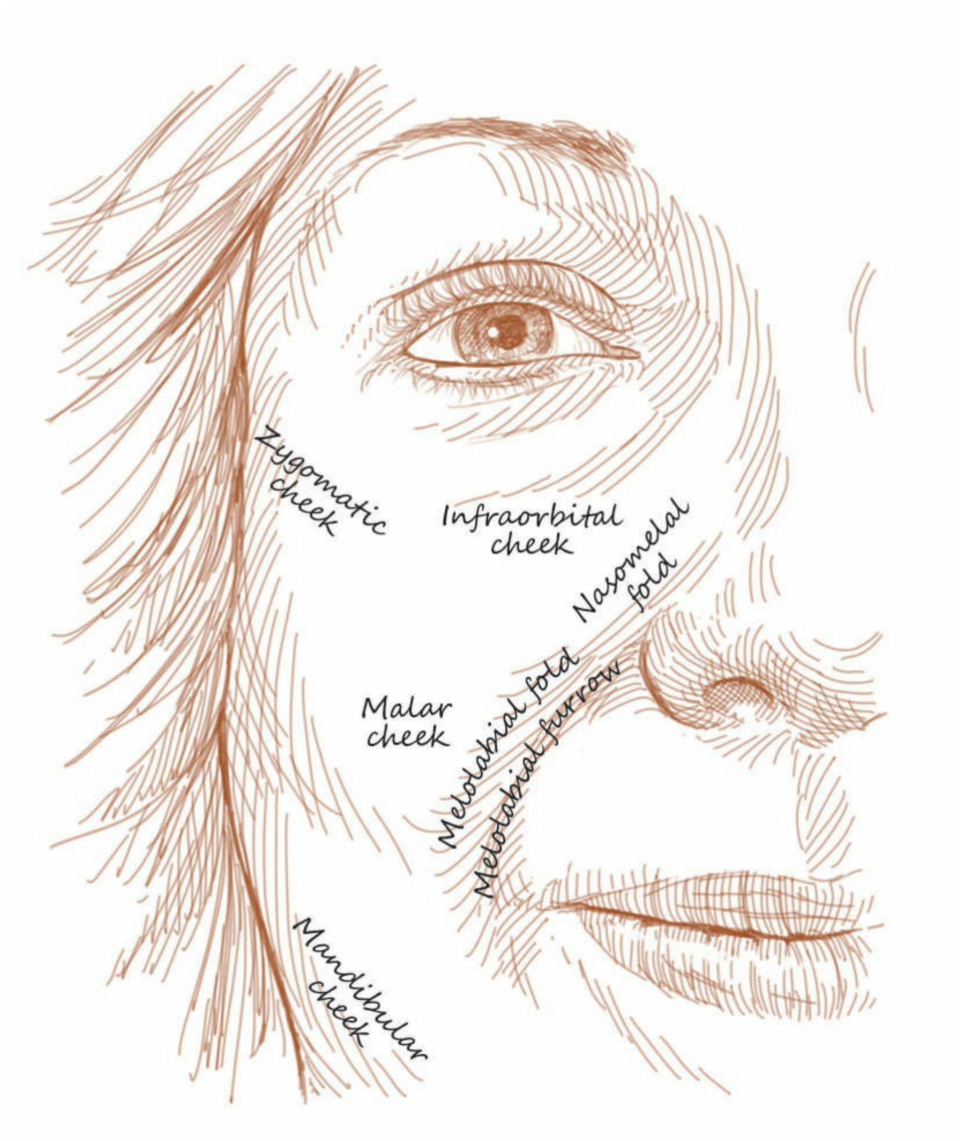
Figure 2.8C. Paramedian forehead flap sutured into place. The remaining exposed defect on the superior forehead is superficial, adjacent to the hairline, and will be allowed to heal by second intention healing.

Figure 2.8D. Final healed result. The flap provides an excellent repair for larger and deep defects on the nose, and at the same time incision lines and donor sites are well healed and hidden.

So, in review, there are a number of techniques available to repair surgical defects. Each defect is different, distinct in its location, size, depth, proximity to free margins and anatomical landmarks. And each patient is different, having differences in cosmetic requirements, medical comorbidities, and tolerance of additional incision lines or staged procedures. The "trick" or the finesse to any repair is to consider these factors together and provide the best repair for a particular defect in a particular location for a particular patient. Remember, usually, there is not

one answer as to how to repair a defect, but there may be a best choice for a particular situation.

3 Cheek Reconstruction



Compared with other cosmetic units, the cheek provides a wealth of adjacent loose tissue from which to borrow. As a result, many surgical defects may be repaired in a side-to-side fashion, and those that cannot may be repaired by a local flap. Grafts and second intention healing are not usually good options in this location. In designing a repair, closure should occur along relaxed skin tension lines (RSTL) whenever possible and free-margin deviation at other adjacent cosmetic units (e.g., eyelid, oral

commissure) should be avoided at all costs.

3.1 MEDIAL CHEEK: SIDE-TO-SIDE REPAIR

Surgical defects on the medial cheek can frequently be repaired in a side-to-side or complex linear closure (**Figs. 3.1A–I**). The key to reconstruction here is to place the incision line within RSTL or at the junction of cosmetic units or subunits (see **Fig. 1.1**). Another important point is that most of the cheek is not a flat surface. Some areas may be flat and adjacent areas, convex or concave. As a result, the incision line in a side-to-side repair may have to be lengthened from the usual 3:1 length-to-width ratio in order to avoid persistent redundant tissue or standing cones (**Figs. 3.1D–I**). In older patients, relaxed skin tension lines may be obvious, but in younger patients one may close the wound within what would be the "expected" or anticipated RSTL. And if the surgical defect is adjacent to or within the border between two cosmetic units (e.g., between the cheek and nose or cheek and lip), the wound may be easily closed along the direction of this border.

For surgical defects in other sections of the cheek, side-to-side repair may also be an excellent alternative. In the third patient, the defect is larger and located in the midinfraorbital cheek **(Fig. 3.1G)**. There is adequate tissue laxity lateral and medial to the wound to close in a side-to-side fashion along RSTL, avoiding secondary tension vectors that might deviate the lower eyelid. The tissue redundancy or standing cone that develops superior to the orbital rim is excised as a tricone but slightly changes direction with the excision following the rhytides and RSTL of the lower eyelid. The tissue redundancy below the surgical defect is also excised within RSTL **(Fig. 3.1H)**. As a result, the wound is closed as an S-plasty, which helps to redirect tension vectors and place incision lines in the natural curving RSTL of the cheek and lower eyelid. By following the RSTL of each particular cosmetic unit and avoiding tension on the lower eyelid, incision lines and scars remain well hidden **(Fig. 3.1I)**.

Figure 3.1A. Surgical defect measures 1.2 × 0.8 cm on the right medial infraorbital cheek.

Figure 3.1B. The wound was closed in a side-to-side fashion along relaxed skin tension lines.

Figure 3.1C. Final healed appearance.

Figure 3.1D. A slightly larger defect on the right medial infraorbital cheek.

Figure 3.1E. The wound is closed at the junction of two cosmetic units (eyelid and cheek) and within relaxed skin tension lines. Use of multiple, uniform, simple interrupted sutures help provide a mindset in the patient during the postoperative period that the procedure was performed meticulously and the final cosmetic result will be excellent.

Figure 3.1F. Short-term healed view.

Figure 3.1G. Younger patient with a 1.9 × 1.7 cm defect on the midinfraorbital cheek following surgical excision of a lentigo maligna (melanoma in situ).

Figure 3.1H. The wound is closed along relaxed skin tension lines, avoiding deviation of the lower eyelid. The gentian violet marks on the skin were matched with other marks on the opposite side of the defect (washed off now) to ensure that the wound was closed perpendicular to the lid margin, and it avoided secondary tension vectors on the lower eyelid. The tricone excised superior to the defect at and above the orbital rim follows the relaxed skin tension line (RSTL) of the eyelid, and the tricone excised inferior to the defect follows the RSTL of the cheek.

Figure 3.1I. Healed result shows the benefit of following the RSTL of the specific cosmetic units.

Key Points

- Small- to medium-sized defects on the cheek can frequently be closed in a side-to-side fashion along RSTL within rhytides or at the junctions of cosmetic units.
- Over convex and concave surfaces, the incision line may have to be lengthened or an S-plasty incorporated to avoid redundant tissue at the poles of the incision.

- In younger patients without obvious rhytides, wounds may be closed in the direction of anticipated rhytides (i.e., anticipated later in life).

3.2 MEDIAL CHEEK: ADVANCEMENT FLAP

This 51-year-old man was left with a relatively large defect located on the left paranasal cheek following Mohs surgery for a basal cell carcinoma (**Fig. 3.2A**). The defect is located on the left paranasal cheek, essentially on the border between cheek and nose cosmetic units (i.e., nasomelal fold). Loose tissue from where to borrow is obviously lacking near the eyelid and nose; therefore, one considers borrowing tissue from either the lateral cheek (e.g., advancement flap) or the inferior cheek (e.g., rotation or island advancement flap). In this instance, there was enough tissue laterally to reconstruct with an advancement flap. The superior aspect of the defect is just at the junction of the eyelid and cheek cosmetic units, creating a good location to place the incision lines. (Remember, incisions at the junctions of cosmetic units or subunits tend to be better hidden than those crossing cosmetic units or subunits.) The incision is carried to the zygomatic cheek, where a tricone is excised to facilitate advancement of the flap, and that tricone placed such that it sits roughly in the direction of a periorbital rhytide (**Fig. 3.2B**). To adequately mobilize this flap, a good amount of undermining in the superficial subcutaneous plane is necessary. When the flap is advanced medially, it is important that the direction of movement and placement of sutures do not in any way distort the lower eyelid downward (note that the direction of the incision laterally climbs superiorly slightly, following the direction of the orbital rim and zygomatic arch). And finally, when the flap is advanced and sutured into place, a standing cone or dog-ear develops inferior to the surgical defect. That dog-ear is excised along the medial cheek and into melolabial furrow but does not violate the small triangular alar sill, which sits between the cheek, nose, and upper lip. The short-term result (**Fig. 3.2C**) demonstrates that these incisions are placed where they will be best hidden, and in a short time (with or without pulsed dye laser assistance), the pinkness to the scars will fade out.

Figure 3.2A. A relatively large defect on the nasomelal (nose–cheek) fold or paranasal cheek. Adjacent loose tissue is either lateral or inferior. An inferior-based repair, such as a rotation flap, may have a higher risk of ectropion due to secondary tension vectors and gravity.

Figure 3.2B. An advancement flap recruits tissue laterally and keeps the incision at the junction of the eyelid and cheek. A tricone was excised at the distal aspect of this incision, helping to mobilize the flap. When advanced medially and sutured into place, a standing cone or tricone was created inferior to the surgical defect. This was excised and repaired, placing the incision within the melolabial furrow and avoiding disturbance of the small triangular isthmus of tissue between the nasal ala, medial cheek, and upper lip (i.e., alar sill).

Figure 3.2C. Short-term healed result. Mild pinkness remains, which will resolve 3 to 9 months after surgery. A vascular laser, such as the pulsed dye laser, can be used to speed the resolution of redness, which is due to increased blood flow in the recent surgical site.

Key Points

- Advancement flaps recruit a small additional amount of loose tissue compared to side-to-side repair.
- In this case, the incision line follows the junction between the cheek and lower eyelid laterally and recruits tissue from the lateral cheek.

- Advancement and closure of the flap must be horizontal and must avoid secondary tension on the lower eyelid.
- Upon advancement of the flap, a standing cone or dog-ear forms inferior to the defect. This is removed with an incision that follows the cosmetic unit junction between the cheek and nose and ultimately falls within the melolabial furrow.

3.3 MEDIAL CHEEK: ISLAND ADVANCEMENT FLAP

In this location, like the previous case, the loose tissue is located on the lateral cheek or inferior cheek (**Fig. 3.3A**). However, two other factors come into play here: (1) the long axis of the defect runs almost horizontally, and (2) the defect is immediately adjacent to the border between the cheek and the upper lip. Because the long axis runs horizontally, an advancement flap from the lateral cheek (e.g., Section 3.2) or a rotation flap from the lateral-inferior cheek will have to travel a greater distance to close the defect and avoid any potential tension being transferred to the lower eyelid. Also, an advancement or rotation flap from the lateral cheek or lateral-inferior cheek would cross the middle of the cosmetic unit and thus be more conspicuous (i.e., not at the junction of a cosmetic unit). We took advantage of the fact that the defect is immediately adjacent to the cheek–lip cosmetic border and that there is loose tissue inferior to the defect and designed an island advancement flap to advance tissue into the surgical defect (**Fig. 3.3B**). Formerly referred to as an island pedicle flap, this flap does not have any cutaneous attachment and therefore is a bit more mobile than a traditional advancement flap. A transposition flap (e.g., rhombic or bilobed) could have been used here, but transposition flaps tend to create more numerous and angulated incisions not easily hidden in RSTL or junctions of cosmetic units, and therefore an island advancement flap was preferred. Although not all incisions are within RSTL or at cosmetic unit junctions, one of the two long sides of the triangle is well hidden in the melolabial furrow and the other runs in the same direction, roughly the direction of the RSTL (**Fig. 3.3C**).

Figure 3.3A. This 77-year-old man was left with a 3.2 × 2.2 cm defect located on the right medial cheek following Mohs surgery for a basal cell carcinoma. The long axis of the defect is almost horizontal, and the defect is inferior to the orbital rim (junction between the eyelid and cheek cosmetic units), making an advancement or rotation flap from the lateral or lateral-inferior cheek more problematic.

Figure 3.3B. An island advancement flap is used to reconstruct the defect, placing one side of the triangle within the melolabial furrow. The triangle should be long and gradually tapering to avoid an abrupt transition between the cheek and lip.

Figure 3.3C. Final healed result. One long side of the triangle is within the melolabial furrow; the other runs roughly in the direction of relaxed skin tension lines, helping to hide final incisions and scars.

Key Points

- An island advancement flap works best in areas where at least one long side of the triangle can be placed within a rhytide, furrow, or cosmetic unit junction.
- In this example, an island advancement flap may help to limit

incision lines at or adjacent to the surgical defect, whereas rotation or transposition flap may create additional lines related to the flap incision or tricone excision.

- Careful undermining and preservation of the subcutaneous pedicle facilitates mobilization of this flap (see also Sections 3.6 and 6.4).

3.4 NASOMELAL FOLD: ISLAND ADVANCEMENT FLAP

Compared to the previous example, this surgical defect is located more superiorly and at the junction of the nose and cheek (nasomelal fold) (**Fig. 3.4A**). Like in Section 3.2, an advancement flap could have been utilized here, but this particular defect extends more onto the nasal sidewall; so the idea was to consider a flap that would not cross from one cosmetic unit into another. Instead, a local flap recruiting tissue from the convexity of the nasomelal fold was selected. Conversely, it would have been difficult for the example in Section 3.2 to be repaired by an island advancement flap (i.e., longer distance to traverse and advancing beard hair too superiorly). In any event, in this particular patient there is relative abundance of loose tissue inferior to the surgical defect within the convexity of the nasomelal fold and the medial cheek, and at least one long incision line will be well hidden along the medial cheek and into the melolabial furrow. One key point here is to direct and suture the flap medially when the flap is advanced superiorly into the surgical wound (**Fig. 3.4B**). In other words, avoid pulling the flap straight up. Secondary tension vectors could pull down the medial canthus of the lower eyelid. Instead, mobilize the flap, maintaining the broad-based vascular pedicle and advance it superiorly and medially, avoiding deviation of the medial canthus (**Fig. 3.4C**).

Figure 3.4A. This woman was left with a 2.5 × 2.0 cm defect located on the left nasomelal fold following Mohs surgery for a basal cell carcinoma.

Figure 3.4B. An island advancement flap reconstructs the surgical defect, utilizing tissue from the medial cheek. Advance the flap superiorly *and medially* and suture into place, so that secondary tension vectors do not pull downward from the medial canthus. Island advancement flaps may trapdoor to some degree, but in this region any bulging of the flap mimics the natural convexity of the nasomelal fold.

Figure 3.4C. Healed result shows incision lines are fairly well hidden.

Key Points

- There is an abundance of loose tissue inferior to the surgical defect in the convexity of the nasomelal cheek.
- As in this case, island advancement flaps excel where one long side of the triangular flap is placed at the junction of cosmetic units or within furrows.

- Advancement of the flap should not only be superior but also medial to avoid secondary tension vectors on the medial canthus or lower eyelid.

3.5 INFRAORBITAL CHEEK: ADVANCEMENT FLAP

In this younger patient, loose or abundant tissue is located primarily lateral or inferior to the defect. The surgical defect is larger than the defect in the third patient in Section 3.1, and a side-to-side repair is not a tenable option (**Fig. 3.5A**). Transposition or rotation flaps coming from inferior to the defect risk potential downward pull on the eyelid, creating an ectropion. This is particularly problematic in older patients, who might already have some degree of senile ectropion. To avoid secondary tension vectors that might affect the lower eyelid, an advancement flap was designed with the superior incision following the orbital rim laterally and slightly superiorly (**Fig. 3.5B**). At the distal-most point of the incision, a tricone was excised, placing the tricone incision roughly in the direction of a periorbital rhytide. The tricone or standing cone created when the flap was advanced into the defect was excised on the malar cheek, falling with a RSTL (i.e. accessory smile line). One of the key points here is that there was adequate tissue laterally from which to recruit. Whenever possible, borrow this lax tissue and keep incision lines at junctions of cosmetic units or within relaxed skin tension lines and rhytides (**Fig. 3.5C**). If the lesion had been larger or the lateral bank was inadequate, one could have designed a rotation flap, recruiting tissue from the lateral and inferior cheek; however, the flap should be designed such that the closure comes in from the side or superior to the defect; so any secondary tension vectors (i.e., pull back) would have been lateral rather than inferior (see Section 3.7).

Figure 3.5A. This surgical defect on the infraorbital or malar cheek sits within one cosmetic unit (the cheek), its superior border at the junction of the cheek and eyelid units.

Figure 3.5B. An advancement flap is performed, keeping the incision at the junction between two cosmetic units. A tricone was excised from the distal point of the incision to help release or mobilize the flap. That tricone was placed within a periorbital rhytide to hide the resultant scar better. The tricone or standing cone inferior to the surgical defect was placed within an anticipated relaxed skin tension line for the same reason.

Figure 3.5C. Healed result.

Key Points

- In this case, there was adequate tissue to recruit from the lateral cheek for an advancement flap. If inadequate, a rotation flap from the lateral and inferior cheek could be designed (e.g., Section 3.7).
- Placement of the incision line at the junction of the eyelid and cheek cosmetic units helps hide resultant scars. At times, the defect may be enlarged slightly so that incisions can follow interunit junctions.
- Advancement of the flap into the defect must avoid tension on the lower eyelid.

- Removal of the tricone inferior to the defect is placed within the RSTL.

3.6 PREAURICULAR CHEEK: ISLAND ADVANCEMENT FLAP AND ADVANCEMENT FLAP

The first defect is located in the glabrous area of the preauricular cheek (**Fig. 3.6A**). Adequate loose tissue is available inferior to the surgical defect in the form of an island advancement or advancement flap. By using an island advancement flap, the repair was kept within the glabrous region, and the two long incisions of the island flap will be fairly well hidden in the pretragal crease and posterior border of the sideburn (**Figs. 3.6B** and **C**). An advancement flap (see second case in this Section) would create a tricone, which would have to be removed anterior to the surgical defect.

The key to an island advancement flap is placement of at least one of the two long sides of the triangle in a RSTL or junction of cosmetic units or subunits. In this case, one side is in or near the pretragal crease and the other is at the junction of the sideburn and glabrous skin. The apex of the triangle tapers around the base of the lobule. The flap must be adequately mobilized while preserving the subcutaneous vascular pedicle. Undermining starts at the base of the triangle (leading edge of the flap) to prevent bulldozing of the flap as it advances forward. The apex is similarly released to prevent tethering. Additional blunt and careful sharp dissection of the flap continues on the sides, base, and apex while checking for mobilization. At the end the flap should be mobile enough to be advanced and sutured into the defect with minimum tension while a healthy pedicle is maintained within the body of the flap. First sutures are generally absorbable, buried vertical mattress sutures securing the base of the flap to the superior edge of the defect followed by additional absorbable, buried sutures around the flap and the secondary defect. The epidermis is approximated and everted with a nonabsorbable running suture or series of simple interrupted sutures except at the apex of the triangular flap where a half-buried horizontal mattress suture (“tip suture”) is used to secure the tip.

Figure 3.6A. Surgical defect on the preauricular cheek is limited to non-hair-bearing skin posterior to the sideburn.

Figure 3.6B. An island advancement flap recruits tissue inferior to the surgical defect and keeps the repair and incisions within this small area.

Figure 3.6C. Short-term appearance at 2 months following surgery. The mild pinkness to the scars will gradually fade.

The second defect measures 3.5 × 2.9 cm and is located within the sideburn of the preauricular cheek **(Fig. 3.6D)**. Similar to the first case, the reservoir of loose tissue is inferior to the surgical defect, but in contrast to the first defect, this one is larger and more anterior, and it may be more difficult to hide some of the longer incisions of the triangular-shaped island flap. An advancement flap with a broad pedicle was designed for the repair **(Figs. 3.6E** and **F)**. By advancing the tissue superiorly, the

sideburn and beard were kept contiguous without disruption or change in the direction of hair growth. In retrospect, a better option for this particular surgical defect might have been to further extend or enlarge the defect more posteriorly so that the incision could have been put directly into the pretragal crease, further hiding the incision line (i.e., making **Fig. 3.6F** more consistent with the diagram in **Fig. 3.6E**). The incision is carried below the lobule, and the tricone is excised posterior to the lobule. When the flap is advanced into the surgical defect, the standing cone that forms on the zygomatic cheek is removed with an M-plasty **(Figs. 3.6E** and **F)**. An M-plasty decreases the anterior extent of the tricone excision, while the limbs of the M-plasty may somewhat resemble periorbital rhytides **(Fig. 3.6G)**.

Figure 3.6D. A surgical defect on the preauricular cheek requires hair-bearing skin for successful repair. Lax skin is primarily located inferior to the surgical defect.

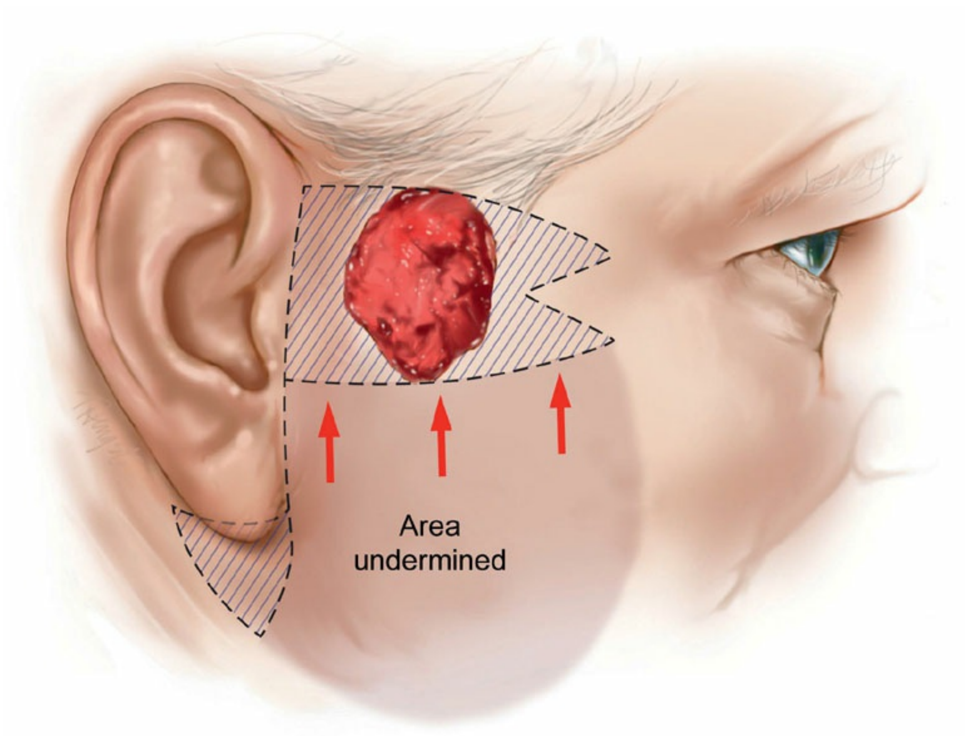


Figure 3.6E. An incision is placed in the pretragal cheek and extends inferiorly beyond the lobule. Undermining must continue beyond the inferior aspect of the flap to recruit the loose tissue for repair. A tricone is excised posterior to the lobule, facilitating movement of the flap and hiding the incision. (Note: Areas with hash marks represent tissue excised or sacrificed to complete the repair.) An M-plasty allows removal of the standing cone but decreases the anterior extent of the excision.

Figure 3.6F. An advancement flap recruited tissue inferior to the surgical defect and maintained contiguity of the sideburn and beard.

Figure 3.6G. Short-term healed result.

Key Points

- An island advancement flap may be a good alternative in instances where at least one side of the triangle can be hidden in RSTL or at the junctions of cosmetic units or subunits. In the first case, one long incision was hidden in the pretragal crease and the other was hidden at the posterior border of the sideburn.
- Without a cutaneous connection, an island advancement flap is a more mobile flap, but that mobility requires a careful balance between undermining and preservation of the vascular pedicle.

- In the second case, an advancement flap recruits tissue inferior to the surgical defect, allows placement of the incision in the pretragal crease, and avoids potential redirection of beard hair (as may happen with a transposition flap).
- A tricone was excised at the distal aspect of the flap to facilitate movement of the advancement flap, and that tricone was placed inferior and posterior to the lobule to hide the scar better.
- In the advancement flap, an M-plasty was performed anterior to the defect to shorten the length of the standing cone or tricone excision and to place the limbs of the M-plasty near periorbital rhytides.

3.7 ZYGOMATIC CHEEK: ROTATION FLAP

The current example in Section 3.7 demonstrates a typical rotation flap on the lateral infraorbital or zygomatic cheek. In this case, the defect followed Mohs surgery for a lentigo maligna (melanoma in situ on chronically sun-damaged skin) (**Fig. 3.7A**). Design of the rotation flap curves upward above the zygoma onto the temple and then curves downward onto the preauricular cheek within the pretragal or preauricular crease, stopping inferior to the lobule of the ear, where a tricone is excised (**Fig. 3.7B**). The arc of rotation is oversized to compensate for flap shortening, which could lead to unfavorable secondary tension vectors (i.e., deviation of the lower eyelid) and potential ischemia at the flap tip. The entire flap is undermined widely, and the flap is first advanced or rotated upward toward the temple and zygomatic arch, where the flap may be secured by a deep fascial or periosteal suture (**Fig. 3.7C**). The remaining flap then continues rotation medially to the surgical defect, where it is sutured into place (**Fig. 3.7D**). By securing the flap superiorly first and then redraping or rotating it into the surgical defect, there is little or no tension on the lower eyelid (**Fig. 3.7D**). The larger rotation flap is essentially broken down into two smaller rotation flaps, thereby avoiding impact of flap shortening with rotation and also avoiding impact of closure of the secondary defect near the preauricular cheek, which would potentially create unfavorable secondary tension vectors working against primary flap movement. This is in contrast to most other shorter rotation flaps or advancement flaps, where the flap is first secured with key sutures into the surgical wound before closure of any secondary defect. However, for rotation flaps with an arc of rotation greater than 90 degrees, this design helps to ensure flap success and avoid

distortion of landmarks and margins. The standing cone or tricone that develops inferior to the surgical defect is excised with the incision placed within RSTL.

Figure 3.7A. Postoperative defect following removal of lentigo maligna (melanoma in situ).

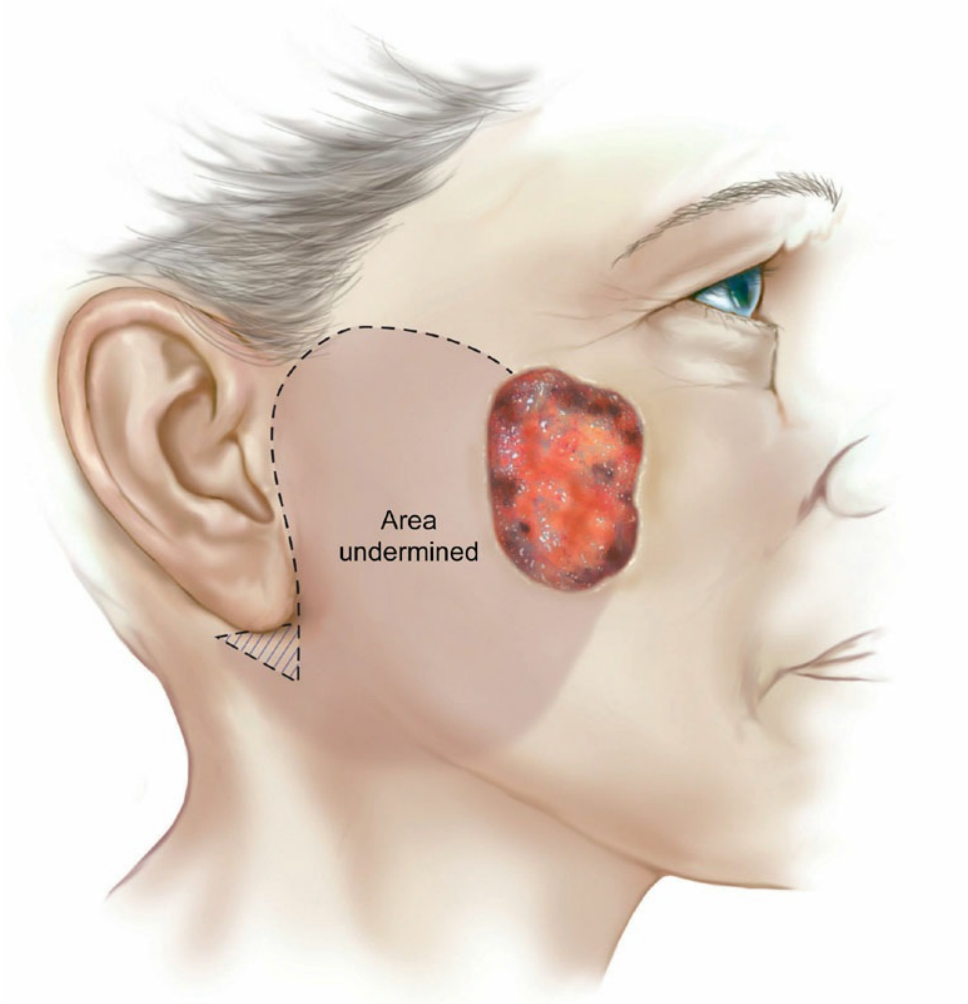


Figure 3.7B. Design of the rotation flap to reconstruct the defect on the cheek. Similar to the design of a Mustarde flap for eyelid repair, the flap starts upward superior to the zygoma onto the temple and then travels downward in an arciform fashion onto the preauricular cheek in the pretragal crease. The incision carries past the lobule, where a tricone is excised (hash marks represent tissue excised as tricone).

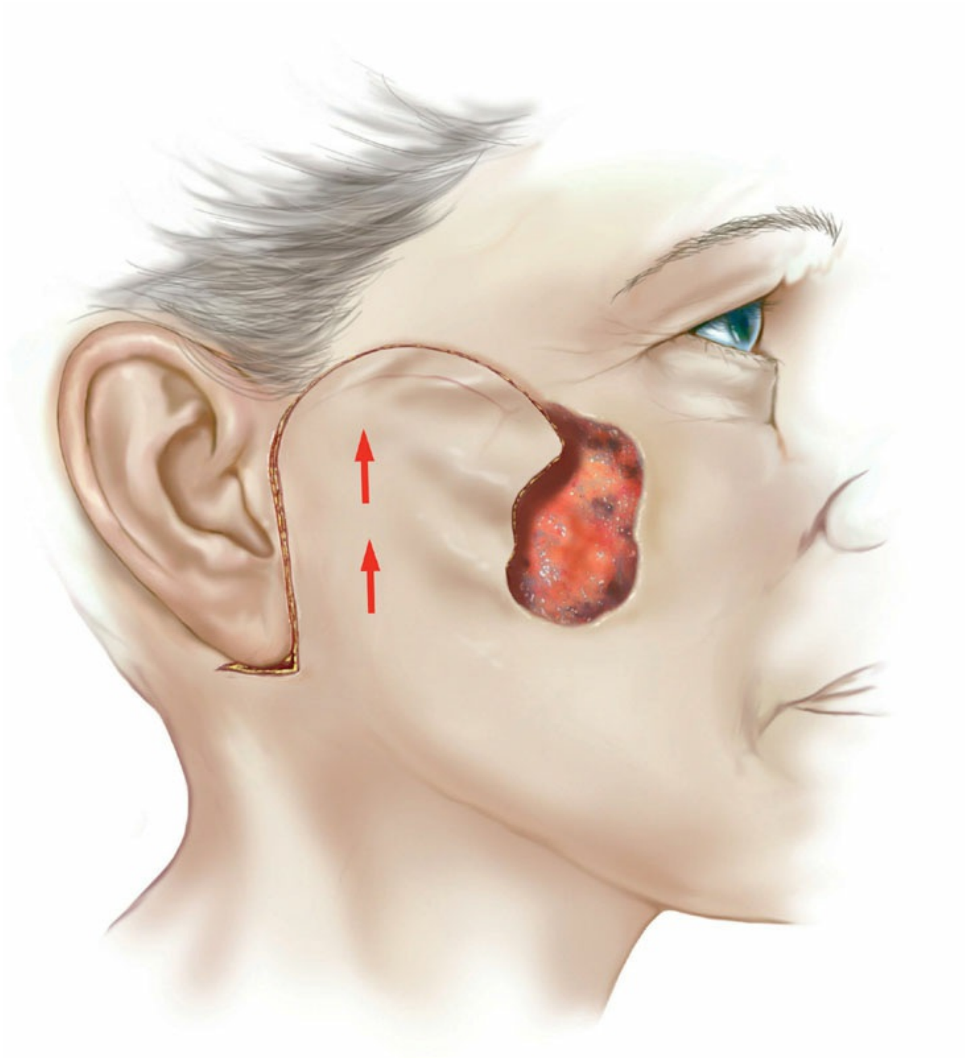


Figure 3.7C. In some ways this rotation flap works best when it is treated like two smaller rotation flaps. First, the flap moves upward from the inferior or mandibular cheek (reservoir of loose skin) superior to the zygomatic arch, where the high-point of the flap is affixed to the underlying zygoma periosteum. This provides additional loose tissue anchored superior to the surgical defect. Second, the flap moves anteriorly and slightly inferiorly so that there is no tension on the lower eyelid.

Figure 3.7D. Flap sutured into place. Tricone excised inferior to the defect within relaxed skin tension lines.

Figure 3.7E. Healed result. The incision has been lightly dermabraded (scarabrasion), and over time, the erythema will fade and the pigmentation will become more similar to the patient's surrounding cheek.

Key Points

- The rotation flap recruits tissue from the lateral and inferior cheek for larger defects on the infraorbital or zygomatic cheek.
- The incision of the flap begins at the superior–posterior border of the defect and travels in an arciform fashion, first extending above the zygoma onto the temple and then curving downward on the pretragal cheek.

- Rather than rotating around a pivot point, the best way to view this flap is moving in two directions: first, arcing upward above the zygoma where it is secured, and second, arcing anteriorly or downward into the defect and avoiding any tension on the lateral canthus or lower eyelid.

3.8 INFERIOR CHEEK: RHOMBIC TRANSPOSITION FLAP AND BILOBED TRANSPOSITION FLAP

For defects on the inferior cheek that are too large for side-to-side repair, a transposition flap may provide a good alternative for reconstruction (**Fig. 3.8A**). Unlike a defect on the infraorbital or zygomatic cheek (e.g., Section 3.7), a rotation flap is not a very good alternative for this inferior cheek defect as the long sweeping arciform incision from a rotation flap cannot be placed in a border between two cosmetic units. A transposition flap may be a better option here for two reasons: (1) better redirection of closure tension vectors and (2) irregular or broken-up incisions from a transposition flap rather than a long arcing incision going against the direction of RSTL. Although the second point is somewhat controversial, a broken line across a cosmetic unit (e.g., cheek) is probably less noticeable than a long curvilinear or straight line that runs perpendicular (rather than parallel) to RSTL or cosmetic unit borders.

Most surgical defects following skin cancer surgery are not rhomboidal in shape but rather round or oval. Rather than converting the defect to a larger rhombus, the same principles can be used to reconstruct a typical surgical defect. In fact, a round or oval defect provides more flexibility in design in that the origin and incisions of the flap can be tailored to recruit from the optimum location of loose tissue and the incisions placed in the direction of RSTL.

The adjacent loose tissue in this example is posterior (lateral) and inferior. A flap originating superior to the surgical defect would risk impact on the lower eyelid or lateral canthus. A flap originating inferior to the surgical defect would cross the mandibular cheek and risk greater redirection or beard hairs as well as potential hypertrophic scarring as may be seen at times when incisions or flaps cross the mandible. Instead, the rhombic transposition flap was designed to recruit tissue primarily lateral or posterior to the surgical defect. The flap is designed and incised as to

mobilize tissue from where it is most abundant and where the risk to nearby free margins or anatomical landmarks is the least. The length of the flap incision lines is approximately equal or slightly greater than the diameter of the defect, and the angle between the two sides of the flap is 60 degrees or less **(Fig. 3.8B)**. Finally, the flap is oriented so that closure of the secondary defect falls roughly in the direction of RSTL. Once the secondary defect is closed and the flap transposed into place, a small tricone forms at the pivot point of the flap, which is excised in such a manner as to avoid compromising the vascular supply of the pedicle **(Figs. 3.8C** and **D)**.

Figure 3.8A. Surgical defect measures 3.9 × 3.6 cm on the left inferior cheek following Mohs surgery for a lentigo maligna (melanoma in situ).

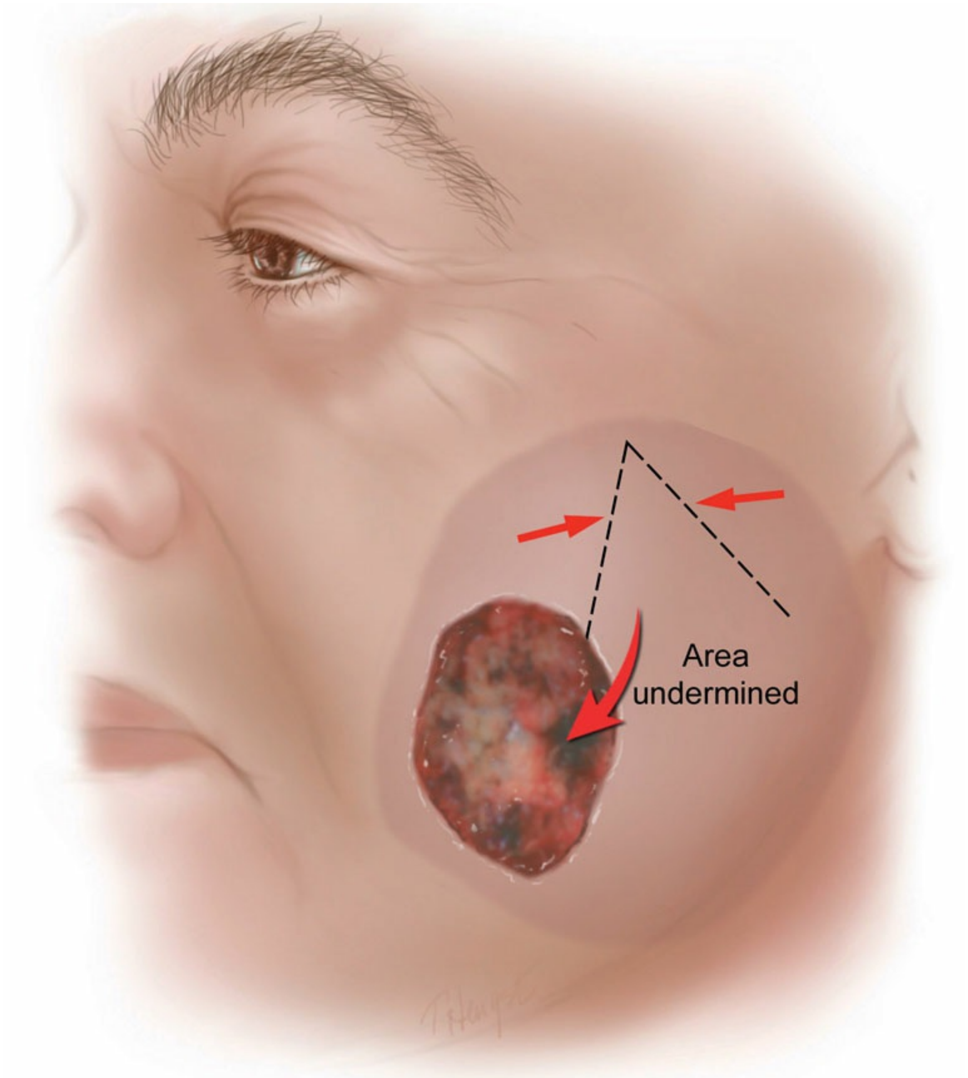


Figure 3.8B. Design of rhombic transposition flap, recruiting tissue from posterior aspect of the cheek. Choose point of origin of incision line and location of flap where there is most abundant tissue, least impact of secondary tension vectors, and best option for closure in RSTL.

Figure 3.8C. Rhombic transposition flap sutured into place. Small tricone excised from the pivot point of the flap, avoiding transection into the pedicle.

Figure 3.8D. Short-term healed result.

In the second case upon clearing these adjacent skin cancers, any residual loose tissue is located inferior to the defect, primarily on the submandibular cheek and neck **(Fig. 3.8E)**. Unlike the first example, the defect is too large to recruit adequate tissue laterally in the shape of a rhombic transposition flap. Apart from a full-thickness skin graft, two options for flap repair remain, both of which cross the mandibular cheek: a rotation flap and a bilobed transposition flap. A rotation flap can redirect some of the tension away from the primary defect, but a transposition flap allows more of the tension to be redirected. As a result, transposition flaps are particularly good near free margins and anatomical landmarks. As

mentioned previously, the trade-off for transposition flaps is that as compared to rotation flaps, the incision lines for transposition flaps tend to be multiple and not easily placed within rhytides or at the junctions of cosmetic units. Summing up, to move a lot of tissue but minimize secondary tension vectors that might distort structures near the primary defect, think of transposition flap, and for areas at or adjacent to cosmetic unit borders while minimizing additional incision lines that potentially would be more noticeable, consider a long arcing rotation flap.

In this second case, a large bilobed transposition flap was designed to minimize the secondary tension vectors around the surgical defect and because a large rotation flap would still leave incisions crossing the cheek against RSTL (see Section 5.4 regarding design of bilobed transposition flaps). Nonetheless, after the flap was transposed into place after closure of the tertiary defect, there was too much tension on the lower eyelid when the flap was sutured into the defect. As a result, a small full-thickness skin graft (taken from the tricone excision) was added to mitigate that tension **(Fig. 3.8F)**. The final result demonstrates a well-healed result without distortion of the lower eyelid, and with the patient's conservative use of makeup, most of the incision lines created by the transposition flap are even better hidden **(Fig. 3.8G)**.

Key Points

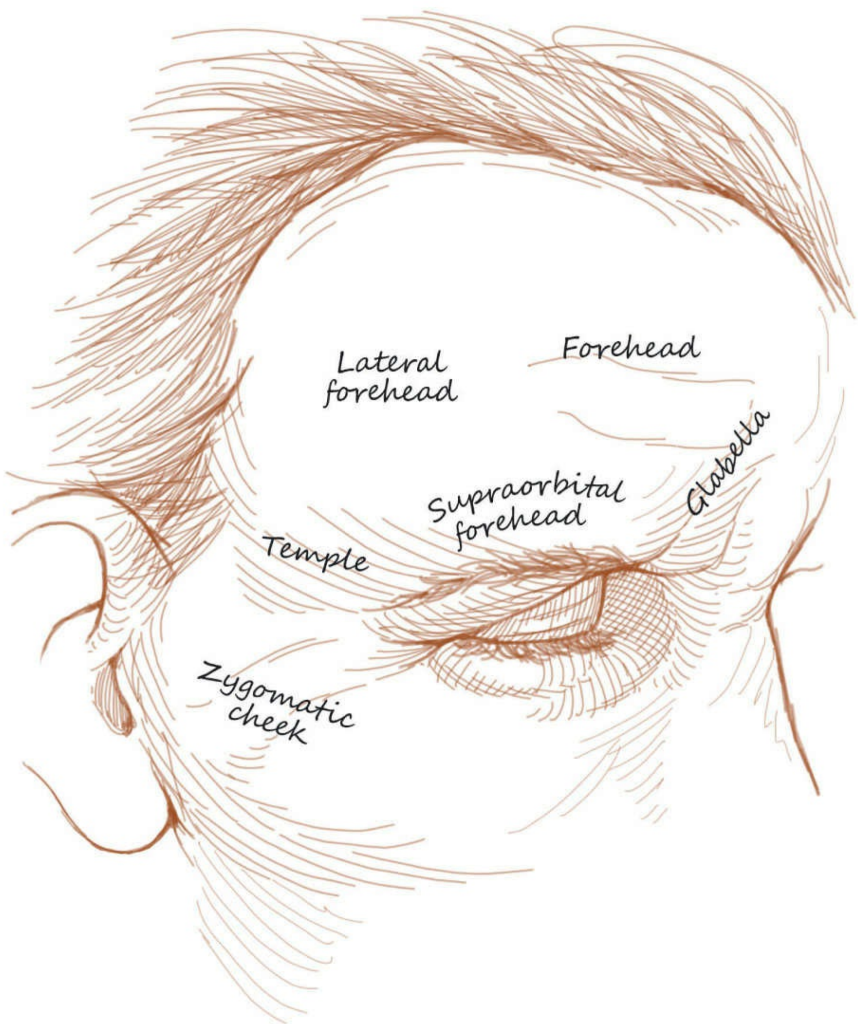
- Transposition flaps, like rhombic or bilobed transposition flaps, are better able to redirect tension away from the surgical defect.
- Design of rhombic and bilobed transposition flaps is similar in this location as it is in other locations (e.g., nose and posterior pinna). Recruit from where there is sufficient loose tissue, and design and execute to avoid tension on free margins or anatomical landmarks (see also Sections 5.1 and 5.4).
- In the second example, after closure of the tertiary defect and transposition of flaps, excessive tension on the lower eyelid was noted. A small, full-thickness skin graft was harvested from the tricone excision and sutured into the surgical defect to minimize tension on a free margin. If your closure has unintended consequences on free margins or landmarks that might be permanent, make adjustments in your plan.

Figure 3.8E. Surgical defect after three-stage Mohs surgical excision of three adjacent squamous cell carcinomas, measures approximately 4.0 × 3.9 cm, leaving a very small island of normal tissue between the defects. (Note: The defect on the medial canthus is a slow-healing wound following radiation of a nonmelanoma skin cancer previously. Surgical correction is pending.)

Figure 3.8F. Repair with bilobed transposition flap and a small full-thickness skin graft. The flap transposed tissue superiorly from the submandibular neck. When the tertiary defect was closed and the flap transposed into the surgical defect, there was still tension on the lower eyelid and medial canthus. To address this, a small full-thickness skin graft, harvested from the tricone excision, was utilized to lessen and redirect tension.


Figure 3.8G. Final healed result.

4 Forehead and Temple Reconstruction



The forehead and temple make up a large portion of the face, but there are significant differences between these two adjacent cosmetic units. The forehead is a convex structure with relatively sebaceous, inelastic skin overlying the frontalis muscle. Relaxed skin tension lines (RSTL) tend to run in the same direction as horizontal forehead rhytides except in the central forehead and laterally at the border with the temple. On the other

hand, the temple is a concave structure whose overlying skin tends to be thinner, less bound down to the underlying temporalis fascia, and therefore more mobile. The temple is also home to one of the "danger zones" in facial reconstruction: the superficial location of the temporal branch of the facial nerve. The surgeon should be particularly cautious in the use of scalpel or undermining scissors in this region as the nerve runs just deep into the subcutaneous fat from the zygomatic arch to the inferior aspect of the lateral forehead. RSTL on the temple tend to run in a radial direction similar to the direction of periorbital rhytides.

4.1 MEDIAL, LATERAL, AND SUPRAORBITAL FOREHEAD: SIDE-TO-SIDE REPAIR

Smaller defects on the forehead can be closed in a side-to-side fashion. The long axis of the direction of closure (i.e., RSTL) varies depending on the exact location. Defects in the midforehead frequently close easiest in a vertical direction as the frontalis muscle is sparser and considerably weaker in the central forehead **(Figs. 4.1A–C)**.

Figure 4.1A. This woman was left with a 0.9 × 0.7 cm defect located on the medial forehead following Mohs surgery for a small basal cell carcinoma.

Figure 4.1B. Closure was accomplished in a vertical direction as the frontalis muscle is much sparser in the central forehead. The wound is more easily closed in this vertical direction (i.e., along relaxed skin tension lines).

Figure 4.1C. Healed result.

In the lateral forehead where the frontalis ends, the RSTL are somewhat mixed. For many defects, closure in the direction of the frontotemporal

fusion point is preferred especially if closure in a nonvertical direction might distort a free margin like the eyebrow **(Figs. 4.1D–F)**.

Figure 4.1D. This defect on the right lateral supraorbital forehead measures approximately 2.3 × 1.7 cm.

Figure 4.1E. The wound was closed in a side-to-side fashion along the frontotemporal fusion point. The frontalis muscle ends at this point, and relaxed skin tension lines are more mixed in this region.

Figure 4.1F. Final healed view. Closure in this direction avoided deviation of the lateral aspect of the eyebrow.

Defects in the central aspect of the right or left forehead where the belly of the frontalis muscle is thickest can be closed along RSTL in the same direction as the horizontal forehead rhytides **(Figs. 4.1G–I)**. Defects up to about 1.0 cm wide can be closed without prolonged upward deviation of the brow, and defects farther (i.e., more superior) from the eyebrow or in older patients can particularly tolerate side-to-side closure without long-term eyebrow elevation.

Figure 4.1G. Defect on the left lateral forehead measures 1.4 × 1.0 cm.

Figure 4.1H. Defect was closed along relaxed skin tension lines in the direction of the horizontal forehead rhytides. Defects of up to approximately 1.0 cm in vertical height (i.e., width of the ellipse) can be closed in this fashion without long-term eyebrow lifting, especially in older patients and for surgical defects more superior on the forehead (i.e., not immediately adjacent to the eyebrow).


Figure 4.1I. Healed result.

Key Points

- Small defects can be closed in a side-to-side fashion on the forehead with the direction of closure dependent upon location. RSTL on the central forehead are somewhat ambiguous, but usually the defect closes easiest in a vertical direction. Lateral forehead defects may close in a horizontal direction, but if near the frontotemporal fusion point, closure in a vertical direction may be preferred. Defects in the midportion of the right or left forehead may close in the direction of horizontal forehead rhytides as long as the eyebrow is not persistently elevated (usually defect size ≤ 1 cm).

4.2 FOREHEAD (EYEBROW): ADVANCEMENT FLAP

As with any surgical defect, one starts by asking, **"What is missing?" (Fig. 4.2A)**. The answer will make it clear as to which reconstruction methods will be successful. As the hair-bearing eyebrow is missing, the only way to successfully reconstruct this defect is to replace or restore the middle of the eyebrow with hair-bearing tissue. As such, grafts or local flaps from the forehead will not provide the necessary tissue. The answer to the question, **"Where are you going to find the tissue to restore the defect?"** is optimally going to be the ipsilateral eyebrow, either medial or lateral to the defect. The medial eyebrow is a paired feature of the central face and therefore any movement of this structure will be immediately visible, both because of its central location and asymmetry with the contralateral eyebrow. A better option is to recruit from the lateral eyebrow, where movement is not readily noticeable. So the best answer to the question **"How are you going to move this tissue to where you need it"** is either advancement flap or island advancement flap. Both of these options advance the lateral eyebrow medially, filling the surgical defect and making the eyebrow contiguous. In this case, an advancement flap was selected to minimize potential for trapdoor (as may happen with island advancement flaps) and to maintain cutaneous connection (and possibly better vascular supply) for the hair-bearing flap. This second point might be somewhat controversial as island advancement flaps tend to be very mobile and have a strong vascular pedicle; however, the farther the flap travels, the greater the pedicle may need to be released and therefore the greater the risk to the vascular supply. In any event, an advancement flap was designed to reconstruct the defect **(Fig. 4.2B)**. The inferior incision was placed just inferior to the eyebrow, extending to the lateral upper eyelid where a tricone was excised to facilitate advancement of the flap and fall in the direction of a periorbital rhytide. After undermining widely by blunt dissection and adequate spot electrodesiccation for hemostasis, the flap was advanced and sutured into place with absorbable, buried vertical mattress sutures. This created a tricone or standing cone superior to the eyebrow, which was excised in a vertical direction. The lateral shortening of the eyebrow is barely noticeable, but maintaining the contiguity of the eyebrow is what makes this repair work so well **(Fig. 4.2C)**.

Figure 4.2A. This man was left with a moderate-sized defect after Mohs surgical excision of a basal cell carcinoma involving primarily the midportion of the eyebrow.

Figure 4.2B. An advancement flap is designed to reconstruct the eyebrow. The incision is just inferior to the eyebrow and continues to the lateral aspect of the upper eyelid, where a tricone is excised. After the flap is advanced and sutured into the surgical wound, a tricone or standing cone is also excised on the forehead superior to the surgical defect.

Figure 4.2C. Healed cosmetic result shows contiguity of eyebrow and most scars fairly well hidden.

Key Points

- Careful evaluation of the wound and repair options help to determine the two best options for repair of this defect: advancement flap and island advancement flap, both of which will recruit hair-bearing lateral eyebrow.
- Advancement of the flap medially helps to maintain symmetry and balance in the central face.
- Wide undermining of the flap and excision of a tricone at the distal aspect of the incision facilitate advancement of the flap into the defect.
- A standing cone or dog-ear forms when the flap is advanced into the surgical defect, and this is excised as a tricone on the forehead.

4.3 LATERAL FOREHEAD: ADVANCEMENT FLAP

Most of the adjacent lax tissue in this location is lateral to the surgical defect **(Fig. 4.3A)**. In addition, by recruiting tissue laterally one minimizes the chance of distortion or lifting of the eyebrow, an oft-forgotten free margin. An advancement flap does not recruit a significant amount of tissue, but there is adequate tissue laterally to close a defect this size with proper mobilization **(Fig. 4.3B)**. One word of advice here is to place the horizontal incision line within or immediately adjacent to a horizontal forehead rhytide. By doing this, a large portion of the surgical scar is optimally hidden on the forehead **(Fig. 4.3C)**. The distal portion of this incision (where the tricone is excised) is at the junction of the forehead and temple. This serves two purposes: improves mobility of the flap (as undermining is carried to the temple) and hides the scar better at the junction of the two cosmetic units. After the flap is advanced and sutured into place, a tricone or dog-ear forms superior to the defect. This is easily excised in a vertical direction.

Figure 4.3A. A surgical defect on the left forehead measures 2.3 × 1.9 cm.

Figure 4.3B. An advancement flap mobilizes lax tissue from the lateral forehead, avoids deviation of the eyebrow, and hides most incision lines.

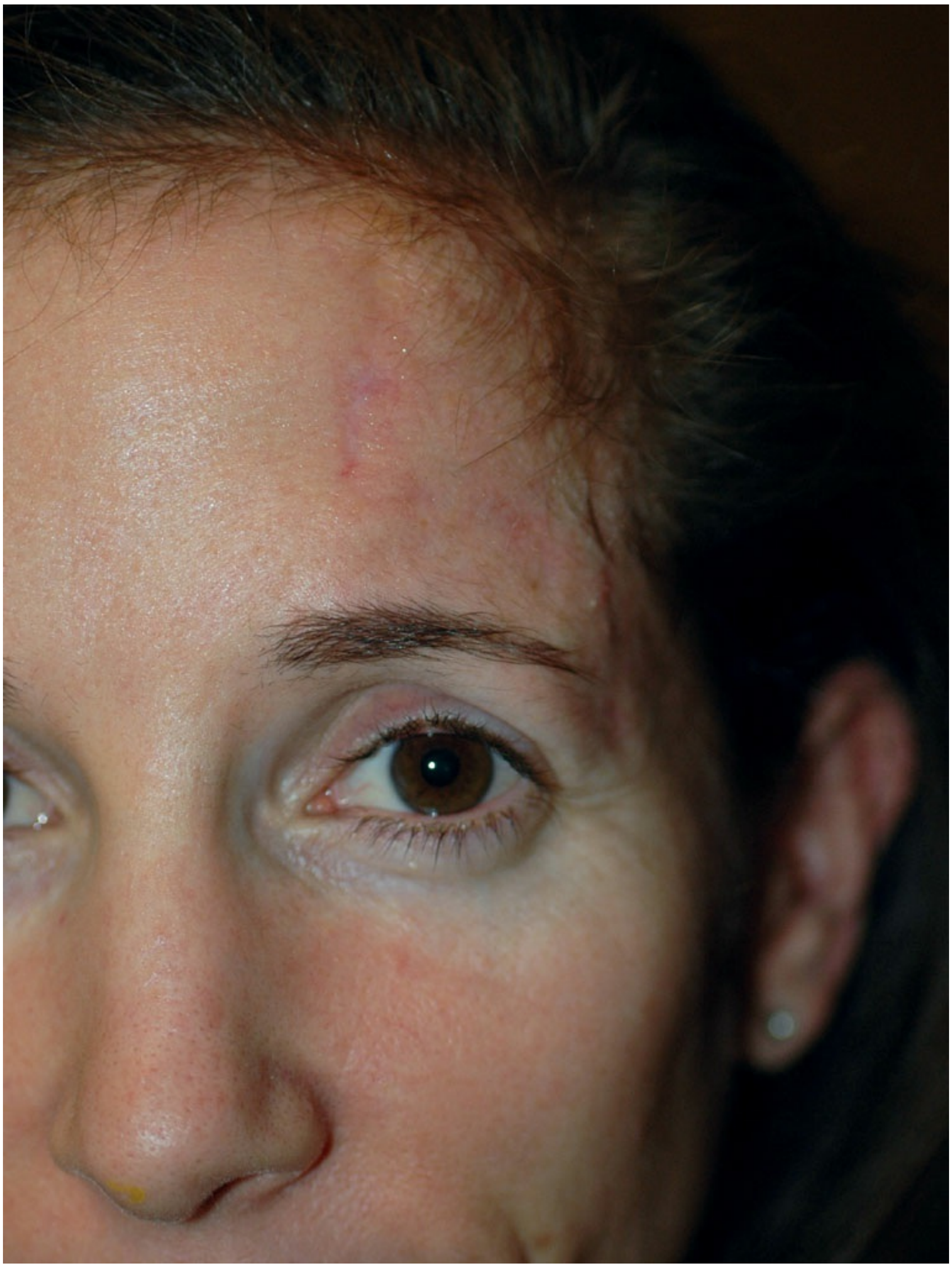


Figure 4.3C. Short-term healed result shows mild pinkness still remaining along incision line but otherwise well healed.

Key Points

- Defects too large for side-to-side repair may close more easily with an advancement flap repair. This is because advancement flaps may recruit a small amount of additional lax tissue in comparison to side-to-side closure.
- Advance the flap medially and avoid tension on the eyebrow.
- The flap incision follows the horizontal forehead rhytide laterally,

where a dog-ear is excised at the junction of the forehead and temple.

4.4 LATERAL FOREHEAD (EYEBROW): FULL-THICKNESS SKIN GRAFT

The lateral aspect of the eyebrow is lost in this young woman status-post skin cancer surgery **(Fig. 4.4A)**. As pointed out in Section 4.2, one should avoid moving the medial eyebrow laterally. While moving the mid or lateral brow medially may be acceptable in reconstruction of the medial brow, moving the medial brow laterally will not provide an aesthetic result. The difference between moving the brow medially or laterally is that the former changes the central face, altering a paired central landmark and making the central face asymmetric. The best option here for this particular patient (who wanted to avoid additional scars from creation of a local flap) was a full-thickness skin graft **(Fig. 4.4B)**. A rhombic transposition flap from the temple would have easily recruited adequate tissue to fill the defect but would have created additional incision lines and scars and could have potentially disturbed the position of the eyebrow. The patient was very happy with the result and chose to use eyebrow pencil to finesse the final result **(Fig. 4.4C)**.

Figure 4.4A. Surgical defect of the lateral eyebrow. Patient wished to avoid any procedure that might make additional scars or potentially change the position of the

eyebrow.

Figure 4.4B. Repair with a full-thickness skin graft (donor site preauricular cheek, placing incision line in pretragal crease). Graft is sutured into place with 6-0 polypropylene sutures, although 5-0, fast-absorbing gut suture would have worked well. Two tacking sutures at the center of the graft were used to approximate the graft to the wound bed, and four sutures outside of the graft to hold a tie-down dressing in place.

Figure 4.4C. Healed result (patient using a small amount of eyebrow pencil to imitate missing eyebrow hair).

Key Points

- Maintain facial symmetry especially in the central face and avoid disturbance of anatomical landmarks or making paired structures asymmetric.
- Listen to your patient and take cues as to what is most important to them.
- A full-thickness skin graft can give an excellent cosmetic result in proper circumstances.

4.5 LATERAL FOREHEAD: O-TO-Z ROTATION FLAP

This surgical defect on the superior and lateral portion of the forehead measures approximately 3.8 × 3.4 cm **(Fig. 4.5A)**. One option to consider for this defect (given that it is large and near the hairline and not near a free margin such as the eyebrow or eyelid) is second intention healing. As discussed before, second intention healing provides an excellent cosmetic result, especially for concave defects of the temple, ear (e.g., conchal bowl), eyelid (e.g., medial canthus), and nose (e.g., superficial defects of the alar crease). Even though this is a convex rather than a concave surface, second intention healing may be something to consider, especially for larger defects or defects in less cosmetically important areas (this area may be partially hidden by the patient's hair). A second option for repair would be a graft, but the difference in final cosmetic result between a graft repair and second intention healing in this example may not be significant. A final option is local flap repair. A local flap will provide faster healing and utilize adjacent tissue so that the color, texture, thickness, and degree of sun damage will be similar to the lost tissue. The issue here is to reconstruct the defect while avoiding deviation of the lateral brow or lateral canthus and try to hide some of the incision lines and scars. For these reasons, a bilateral rotation flap was chosen **(Fig. 4.5B)**.

Figure 4.5A. A 3.8 × 3.4 cm defect on the superior-lateral forehead following Mohs surgery for a nonmelanoma skin cancer.

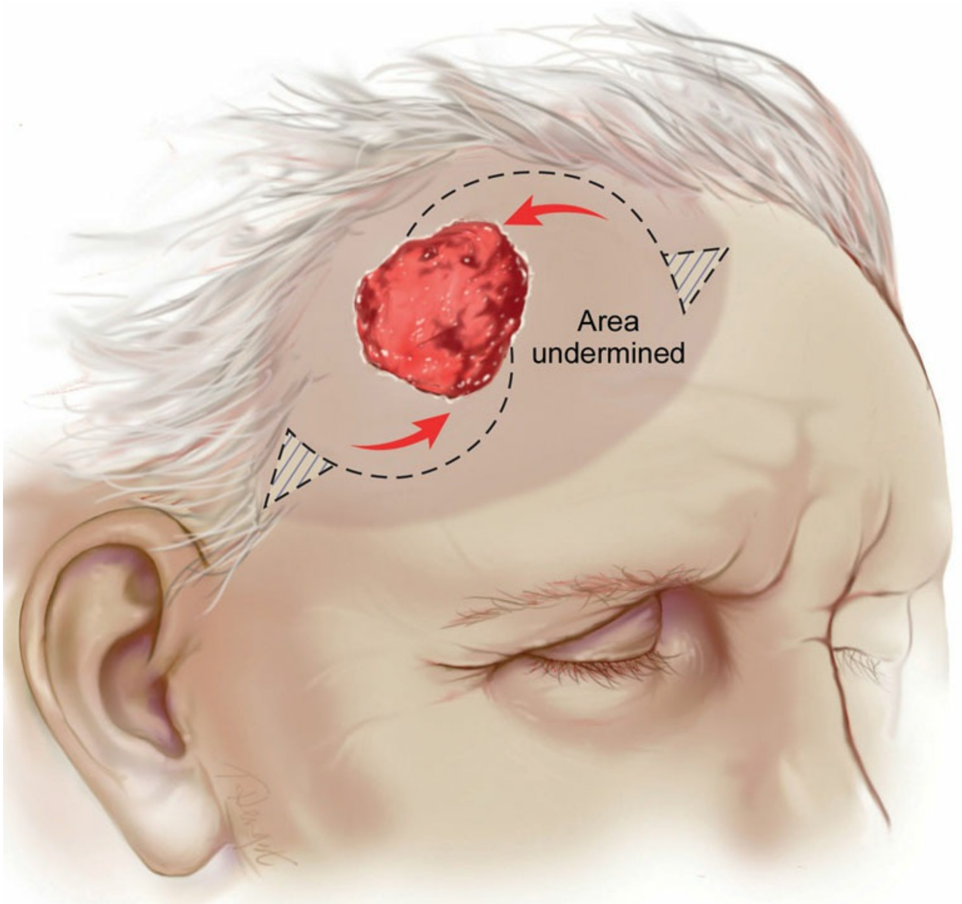


Figure 4.5B. An O-to-Z rotation flap was designed to reconstruct the defect and redirect much of the closure tension vectors along the two lengths of the flaps. Note that both flaps must be widely undermined and tricones excised to facilitate rotation of the two flaps and closure of the defect (hash marks represent tissue excised as tricones). Similar flaps may be useful for reconstruction of defects on the scalp.

Bilateral rotation flaps redistribute secondary tension vectors on different sides of the surgical defect. In the O-to-Z variant mirror-image flaps rotate centrally, recruiting loose tissue from opposing sides of the defect. Adequate undermining, incorporation of tricone excisions, and understanding of available loose tissue help to design and adequately mobilize these flaps. Like most other rotation and advancement flaps (but unlike transposition flaps), first sutures should be used to secure the advancing or rotating flap(s) into the surgical defect **(Fig. 4.5C)**. After this, the tricone and secondary defects are closed. The superior arciform incision is fairly well hidden along the hairline, and the bilateral movement of the flaps and redistribution of the secondary defect over a large area avoids long-term distortion of the eyebrow or eyelid **(Fig. 4.5D)**.

Figure 4.5C. Order of closure of the surgical and secondary defects help to make completion of the flap easier and ensure proper placement of sutures. First, flaps should be rotated into the surgical defect and sutured into place (“A”). Next, closure of the tricone defects (“B”) decreases the size of the remaining secondary surgical defects for closure. (Tricones should be designed so that closure does not distort free margins or anatomical landmarks and will be fairly well hidden.) Finally, secondary surgical defects are closed (“C”).

Figure 4.5D. Appearance of the two opposing rotational flaps sutured into place. Rather than having closure tension vectors where the two flaps meet centrally, the closure tension vectors are spread along the lengths of the two flaps.

Key Points

- O-to-Z bilateral rotation flaps are most commonly used on the scalp, where hair hides the Z-shaped scar, but in some other situations the shape and/or location of the defect might benefit from the design and redistribution of tension vectors of this repair.
- Bilateral rotation flaps redistribute secondary tension vectors on opposite sides of the surgical defect and are somewhat adaptable to

the defect and location.

- Unlike transposition flaps, first sutures should be used to secure the flaps to one another after rotating together centrally. Next, the defect created by excision of the two tricones should be closed, and finally, the secondary defect along the edge of the flaps should be closed.

4.6 MIDFOREHEAD: BILATERAL ADVANCEMENT FLAP

This surgical defect measures 3.0 × 3.0 cm on the midforehead of an older woman following Mohs micrographic surgery of a lentigo maligna (melanoma in situ) **(Figs. 4.6A and B)**. The defect is too large for a side-to-side closure and too deep for a full-thickness skin graft although a graft is frequently a viable alternative in defects too large to repair by local flap. Fortunately, in contrast to younger patients, older patients provide more lax tissue for repair. In this situation, most of the lax tissue is lateral to the surgical defect. In addition, the abundance of rhytides and furrows in older patients provides more areas to place and hide incision lines and resultant scars.

Figure 4.6A. Lentigo maligna (melanoma in situ on chronically sun-damaged skin) on forehead of elderly female.

Figure 4.6B. Surgical defect after Mohs surgical excision (with immunostains) of lentigo maligna.

A bilateral advancement flap recruits more tissue than would be available with a single advancement flap and also balances donor sites on both sides of the surgical defect. This patient's horizontal incisions were placed along a horizontal forehead rhytide with tricones excised at the distal points of these two incisions to facilitate movement of the flaps centrally. Undermining is at the level of the deep subcutaneous fat, and the flaps are advanced centrally and sutured together with buried vertical mattress sutures (e.g., 4-0 polyglactin 910). The subsequent standing cone or tricone superior to the surgical wound is excised as an M-plasty in a vertical direction **(Figs. 4.6C and D)**. An M-plasty minimizes the length of the tricone excision, avoiding crossing of the frontal hairline.

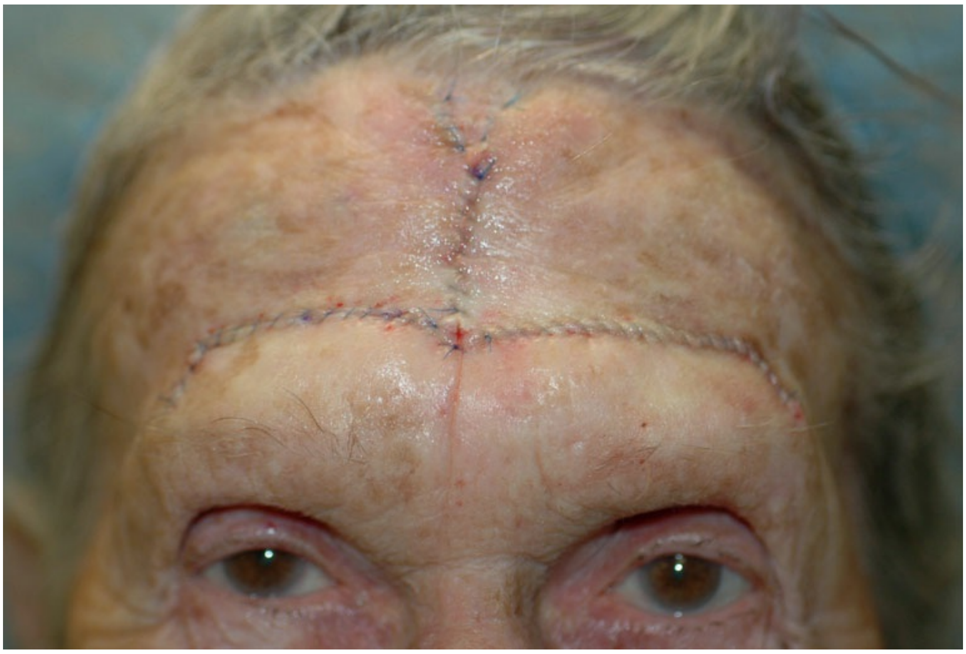


Figure 4.6C. Bilateral advancement flap to reconstruct central forehead. Incisions carried to the junction of forehead and temple, where a tricone is excised bilaterally to facilitate advancement of the flaps centrally. After flaps are secured in the surgical defect, tricone or standing cone that developed superior to the defect is excised as an M-plasty so that incision would not extend into hairline.

Figure 4.6D. Healed cosmetic result. Longest incision line and scar placed within horizontal forehead line, helping to hide final scar.

Key Points

- A bilateral advancement flap decreases the distance that a single-side advancement flap would have to travel and balances donor sites between both sides of the defect, which may help maintain facial symmetry for midline defects.
- Incisions should be placed in horizontal forehead lines when possible.
- Excision of tricones at the ends of the incisions and adequate undermining help mobilize flaps.
- First sutures are used to secure the flaps together after they are advanced centrally.
- An M-plasty can be used to decrease the length of the standing cone excision.

4.7 MIDSUPERIOR FOREHEAD: BILATERAL ROTATION FLAP

The surgical defect measures 3.4 × 2.9 cm and is located on the superior midforehead of a younger woman **(Fig. 4.7A)**. Similarities to the example in Section 4.6 include a large defect on the central forehead, but differences include the younger age of the patient and proximity to the patient's frontal hairline. Both repairs recruit tissue bilaterally, dividing the origin of the flaps and maintaining facial symmetry. The two flaps differ in how they move the loose tissue into the surgical defect. The example in Section 4.6 uses a bilateral advancement flap to move tissue while placing the longest incision within a horizontal forehead rhytide. The current case (i.e., Section 4.7) uses a bilateral rotation flap to place and hide the incision line along the frontal hairline **(Fig. 4.7B)**.

The bilateral rotation flap follows the rounded direction of the frontal hairline bilaterally. At the distal aspect of each incision, a tricone is excised, following the irregular frontal hairline. The flaps are widely undermined by blunt dissection in the subcutaneous plane and rotated centrally and sutured into place. The resultant standing cone or dog-ear at the inferior pole of the defect is removed and closed in a vertical direction, which should be well hidden, because the RSTL in the central forehead tend to run vertically **(Fig. 4.7C)**. These flaps are also useful in other

locations, such as central defects on the nasal tip (see Section 5.5), vermilion of the lip (see Section 6.6), and chin defects where the arcing incision may be placed within the mental crease.

Key Points

- Consider rotation flaps near rounded or arciform borders or free margins (e.g., hairline, vermilion border, nasal tip, chin).
- Bilateral rotation flaps redistribute secondary tension vectors over a larger area and recruit tissue bilaterally, helping to preserve symmetry on opposite sides of the defect.
- First sutures should be done to secure the two flaps together centrally. Next, the defects caused by excision of the tricones should be closed, and finally the secondary defects along the two flaps should be closed.

Figure 4.7A. Large surgical defect on the midsuperior forehead adjacent to the frontal hairline.

Figure 4.7B. A bilateral rotation flap follows the rounded shape of the frontal hairline. Tricones at distal points of the two incisions fit within the natural irregular hairline and aid rotation of the flaps centrally.

Figure 4.7C. Healed result 6 weeks following reconstruction. Vertical and arciform scars are well hidden and facial symmetry is maintained.

4.8 TEMPLE: SECOND INTENTION HEALING

Second intention healing is an excellent choice for defects in concave areas like the temple, especially if the defect is superficial **(Figs. 4.8A and B)**. If the defect is adjacent to a free margin like the lateral canthus or eyelid margin, care must be taken to avoid deviation of the free margin secondary to scar contracture (see second example in Section 8.6). Second intention healing is particularly well suited for defects too large to

reconstruct with side-to-side repair or local flap **(Figs. 4.8C and D)**. In those cases, there are two options: second intention healing or graft repair (full- or split-thickness). For many surgical defects, the final cosmetic result between second intention healing and a full-thickness skin graft is comparable. Perhaps, full-thickness skin grafts would be preferable for a younger patient in a more cosmetically sensitive area, but this is not always the case. Grafts tend to contract less than wounds allowed to heal by second intention healing; so defects immediately adjacent to free margins or anatomical landmarks might best be repaired by a graft or partial closure, rather than being allowed to heal via second intention healing.

Key Points

- Second intention healing may be a good option in select cases, especially in concave, superficial defects not adjacent to free margins or anatomical landmarks.
- Proper wound care speeds healing and will likely improve final cosmetic result. This includes keeping the wound clean and moist (e.g., covered with petrolatum and nonstick bandage).

Figure 4.8A. Large superficial defect on the left temple following skin cancer surgery.

Figure 4.8B. Healed cosmetic result. Note: No deviation of eyebrow or eyelid following second intention healing. Key point is that wounds heal quicker and usually with better cosmetic results when proper wound care is utilized (keep wound clean, moist with antibiotic salve or petrolatum, and covered with a nonstick bandage).

Figure 4.8C. Large superficial wound on right temple.

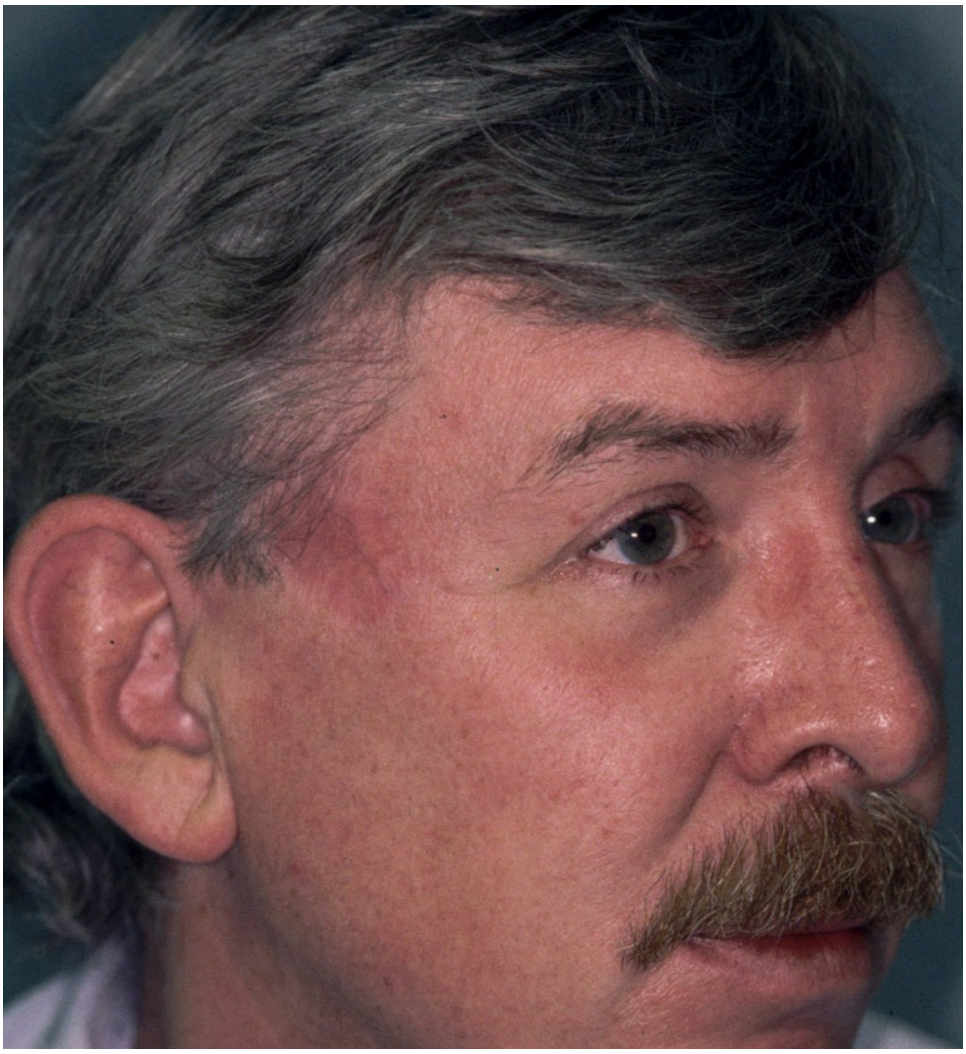


Figure 4.8D. Healed result in the concave area following proper wound care.

4.9 TEMPLE: ADVANCEMENT FLAP

The temple is an area where reconstruction by advancement flap may provide some advantages over other alternatives. This may be particularly true for defects near the hairline or adjacent to the eyebrow **(Figs. 4.9A and D)**. The loose tissue is generally inferior or lateral (posterior) to the defect. The plan is to move tissue and avoid disturbing the eyebrow or hairline. In the first case, the incision follows the hairline to the base of the sideburn, where a tricone is excised **(Fig. 4.9B)**. The point is to avoid disturbing the natural hairline with a scar. The standing cone that forms anteriorly to the defect when the flap is advanced into the defect is removed with an M-plasty. In this case, an M-plasty was used to shorten the length of standing cone excision and to place the limbs of the M-plasty within the periorbital rhytides. The mild amount of "pull" to the inferior cheek quickly resolves as long as the deviation is not significant **(Fig.**

4.9C).

The second case illustrates a surgical defect near the eyebrow **(Fig. 4.9D)**. Rather than closing the defect in a side-to-side fashion, an advancement flap avoided disturbing the lateral eyebrow in this young patient. (Perhaps, in this example, the defect could have been enlarged slightly in the inferior direction so that the incision was just above the eyebrow to hide the scar better.) The incision is carried laterally and the tricone excised so as to place it in an actual or perceived periorbital rhytide **(Fig. 4.9E)**. Incisions are hidden within a periorbital rhytide, just above the eyebrow and at the junction of the temple and forehead **(Fig. 4.9F)**.

Key Points

- Advancement flaps may be useful in the temple to recruit tissue inferior or lateral to the defect and to avoid deviation of the eyebrow.
- Injury to the temporal branch of the facial nerve should be avoided by understanding the superficial route of the nerve and keeping incisions and undermining in a more superficial plane.
- When designing a flap, placement of incisions and tricones should be considered where they will be best concealed, such as along the hairline, within periorbital rhytides, above the eyebrow, and at the junction of cosmetic units (e.g., temple and forehead).

Figure 4.9A. Surgical defect on the posterior temple.

Figure 4.9B. Design of the advancement flap to reconstruct the defect, the incision following the temporal hairline until it reaches the base of the sideburn. At this point, a tricone is excised, keeping the incision and the tricone excision well hidden along the hairline. The tricone aids in the advancement of the flap into the surgical defect. An M-plasty is performed to remove the standing cone that forms anterior to the surgical defect, its limbs situated in the direction of periorbital rhytides.

Figure 4.9C. Final healed result.

Figure 4.9D. Surgical defect on the temple.

Figure 4.9E. Advancement flap designed to recruit tissue lateral or posterior to the surgical defect. Tricone excised to mobilize the flap is placed within an anticipated periorbital rhytide. Standing cone excised as a tricone superior to the defect is placed at the junction of cosmetic units (temple and forehead).

Figure 4.9F. Healed result.

4.10 TEMPLE: ROTATION FLAP

This large surgical defect on the temple and temporal scalp measures 4.9 × 4.0 cm **(Fig. 4.10A)**. One option for this defect would be second intention healing, as wounds in concave areas (like the temple) tend to heal quite well via second intention healing (see Section 4.8A–D). In this particular example, the downside to second intention healing is longer time for wound healing, contraction of the wound and scar, and missing hair not replaced. Consultation with the patient helps to determine if healing by second intention is a better option for a particular case.

Another option for this surgical defect is flap reconstruction. In this case, the loose skin is located inferior to the surgical defect, essentially recruiting lax tissue from preauricular and mandibular cheek and neck. An arciform incision is made, falling within the preauricular or pretragal crease area, and the distal point of the incision is carried below the lobule, where a tricone is excised posterior to the lobule **(Fig. 4.10B)**. Blunt and sharp dissection is used carefully to mobilize the flap, and it is rotated into the surgical wound and sutured into place. By rotating tissue into the area, the hairline is fairly well preserved. An M-plasty is performed anterior to the surgical defect, which allows for a shorter scar and allows placement within real or perceived periorbital rhytides **(Figs. 4.10C and D)**.

Figure 4.10A. Large surgical defect on the temple and temporal scalp. Loose tissue in this area would be primarily inferior to the defect.

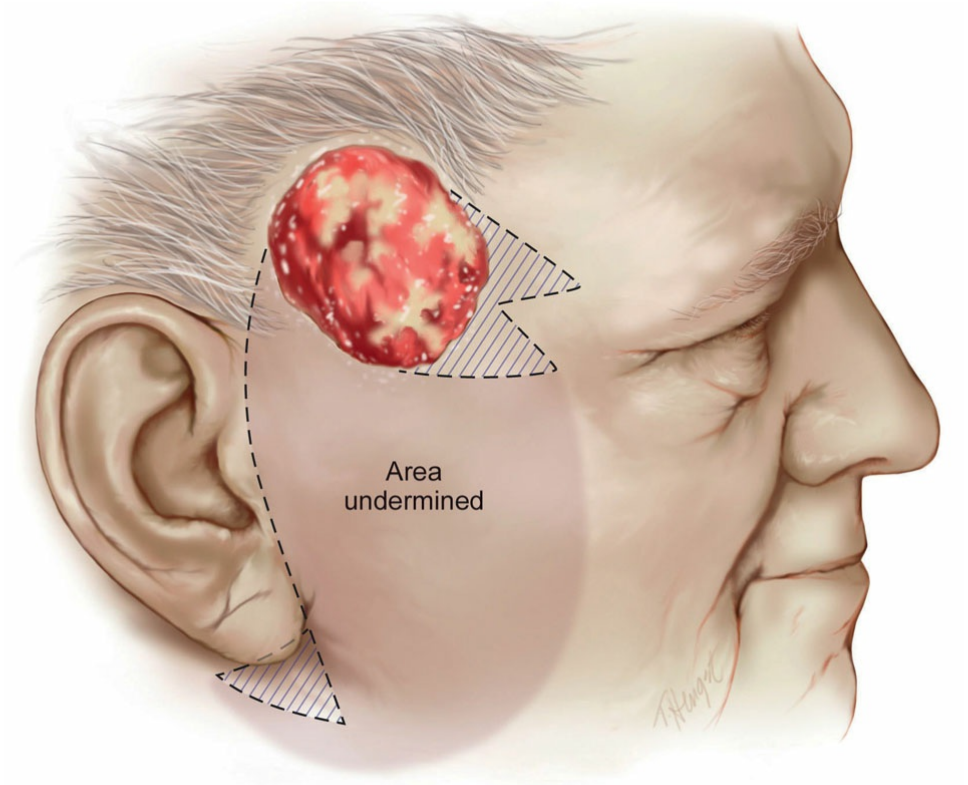


Figure 4.10B. A rotation flap is designed to recruit lax tissue from the preauricular and mandibular cheek. This defect and repair is similar to the advancement flap designed for repair of the defect in Section 3.6. At the distal aspect of the incision, a tricone is excised behind the lobule (hash marks represent tissue excised as a tricone or M-plasty). Undermining must be continued just beyond the mandibular cheek to recruit adequate tissue for repair. When the flap is rotated and sutured into place, a standing cone is created, and this is removed with an M-plasty.

Figure 4.10C. The flap is rotated into the surgical wound and sutured into place. An M-plasty is performed to remove the standing cone and minimize the length of the incision (within the temple keep incisions and undermining superficial to avoid trauma to the temporal branch of the facial nerve).

Figure 4.10D. Most incision lines are well hidden because they are within rhytides, at junctions of cosmetic units or hidden behind the lobule.

Key Points

- Flap reconstruction for larger defects on the temple will likely recruit lax tissue on the preauricular or mandibular cheek via advancement or rotation (or possibly transposition) flap.
- Placement of the incision line in the pretragal or preauricular crease helps to hide the longest incision of the flap.
- A large tricone is excised posterior to the lobule and undermining continued below the mandible to adequately mobilize the flap.
- The flap is advanced or rotated into the surgical wound and sutured

into place. The standing cone is removed as an M-plasty, remaining superficial to avoid injury to the temporal branch of the facial nerve.

4.11 TEMPLE: RHOMBIC TRANSPOSITION FLAP

The first defect is adjacent to the lateral eyebrow and lateral aspect of the upper eyelid **(Fig. 4.11A)**. A transposition flap will provide the best chance to avoid persistent distortion of either of these two structures. Once the secondary defect is closed (e.g., by 4-0 or 5-0 polyglactin 910 buried vertical mattress sutures), the flap can be transposed into the surgical defect, sutured into place, and any tricone formed at the pivot point can be excised. One point about excision of the tricone or standing cone is to angle the excision away from the pedicle of the flap. By angling away from the pedicle, the risk of vascular compromise to the flap is minimized **(Figs. 4.11B and C)**.

Figure 4.11A. Surgical defect of the anterior temple adjacent to the eyebrow.

Figure 4.11B. A rhombic transposition flap permits transposition of healthy tissue for reconstruction of the defect and helps to minimize secondary tension vectors.

Figure 4.11C. Healed result.

The second example is a larger defect on the temple adjacent to the forehead **(Fig. 4.11D)**. Too large to easily repair with an advancement flap, a transposition flap can recruit sufficient tissue from the area superior to the surgical defect at the junction of the two cosmetic units **(Fig. 4.11E)**. Like the first example, the transposition flap is the best option for moving tissue from where it is available and avoiding unfavorable secondary tension vectors. In addition to providing enough tissue to fill the defect, the rhombic flap recruits tissue from the junction of the temple and forehead

with closure of the secondary defect in an optimal position to conceal the resultant scar **(Fig. 4.11F)**.

Key Points

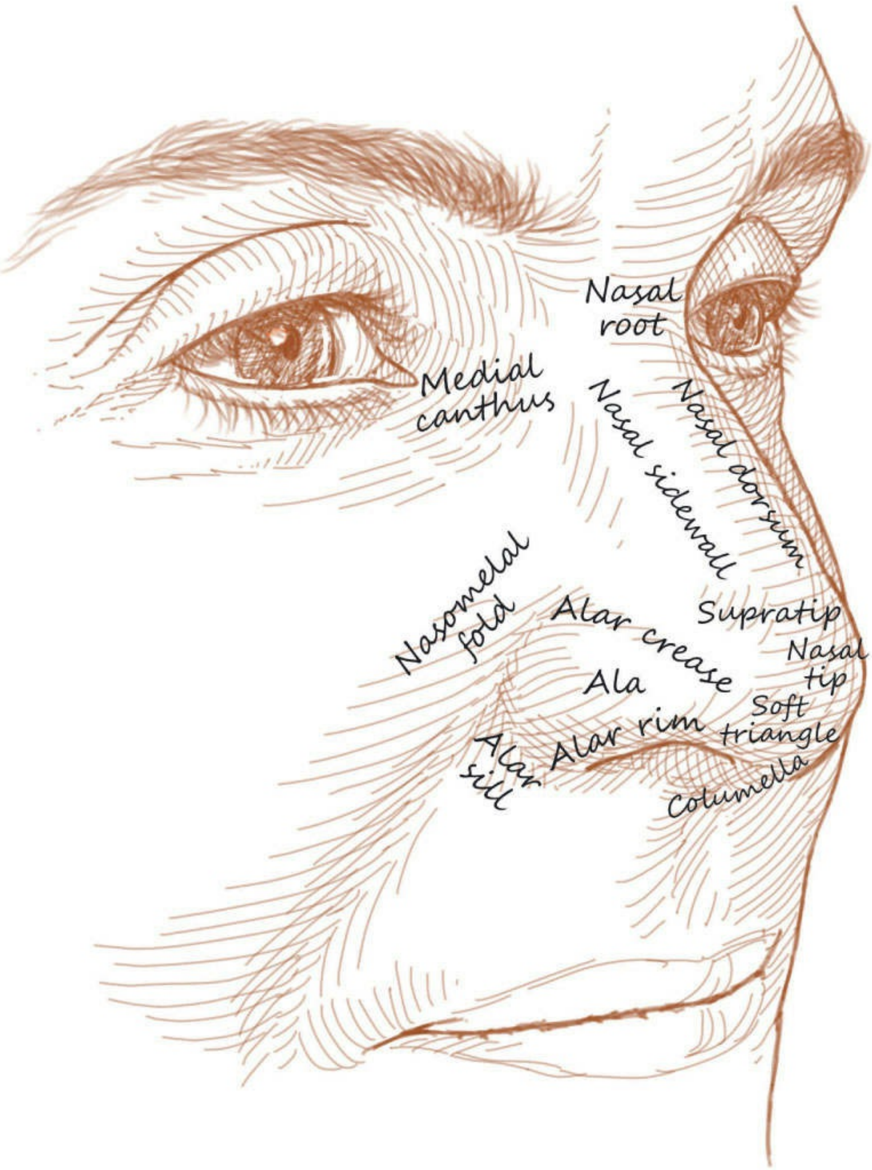
- Transposition flaps are superior to advancement and rotation flaps in redirecting secondary tension vectors around the surgical wound, and therefore, may be an excellent choice near free margins like the eyebrow or eyelid.
- Key technical point to transposition flaps: The secondary defect should be closed first (i.e., first sutures should be to close the secondary defect). This key point allows the flap to transpose into the surgical wound.
- When excising a standing cone or tricone from the pivot point of the flap, cutting into the pedicle of the flap should be avoided.

Figure 4.11D. Surgical defect on the temple near the junction of the temple and forehead measures 3.1 × 2.8 cm following three-stage Mohs surgery procedure for squamous cell carcinoma.

Figure 4.11E. A rhombic transposition flap recruits adequate tissue for reconstruction, transposing tissue from the area superior to the surgical defect and avoiding secondary tension vectors on free margins. Note that excision of the tricone avoids cutting into the pedicle of the flap. Mild transient blanching of the flap and surrounding tissue is secondary to epinephrine effect in the local anesthesia, and mild weakness of the temporal branch of the facial nerve is also a short-lived effect of the anesthetic.

Figure 4.11F. Healed view at 4 months. There is some demarcation between the healed scar and the surrounding sebaceous skin and mild widening of the scar, but the patient was satisfied with the result and declined any further procedure to improve the final result (e.g., scarabrasion or scar revision).

5 Nose Reconstruction



Centrally located with complex concave and convex topography, the nose is usually the next anatomical feature noted following initial "eye" contact. Successful reconstruction of the nose requires attention to the subtle differences in individual cosmetic subunits and preservation of a

symmetric and properly proportioned, shaped, and surfaced structure. In addition to aesthetic importance, the functional integrity of the nose must be maintained, and suitable structural and mucosal reconstruction is necessary for more complicated and full-thickness defects. In short, reconstruction has to be done in cosmetic subunits whenever possible, maintaining a symmetric and appropriate nasal shape and surface while preserving function by avoiding poorly designed repairs that may result in iatrogenic decreased air flow.

5.1 RIGHT NASAL SUPRATIP, RHOMBIC TRANSPOSITION FLAP (AND NASAL DORSUM/SIDEWALL DEFECT REPAIRED WITH RHOMBIC TRANSPOSITION FLAP)

Defect on the right nasal supratip is too large to close in a side-to-side fashion without causing significant distortion to nearby structures **(Fig. 5.1A)**. A rhombic transposition flap is a good choice for filling the surgical defect and avoiding unnecessary tension on the nasal tip or ala **(Fig. 5.1B)**. Most of the adjacent loose tissue is located superior to the surgical defect. As a transposition flap, first sutures are used to close the secondary defect, effectively causing the flap to transpose over the intervening tissue and “fall” into place. After the secondary defect is closed and the flap is transposed into place, a small tricone or standing cone develops. This tricone is excised from the point of rotation, angling away from the pedicle and avoiding transection of blood vessels within it **(Figs. 5.1C and D)**.


Figure 5.1A. Surgical defect on the right nasal supratip.

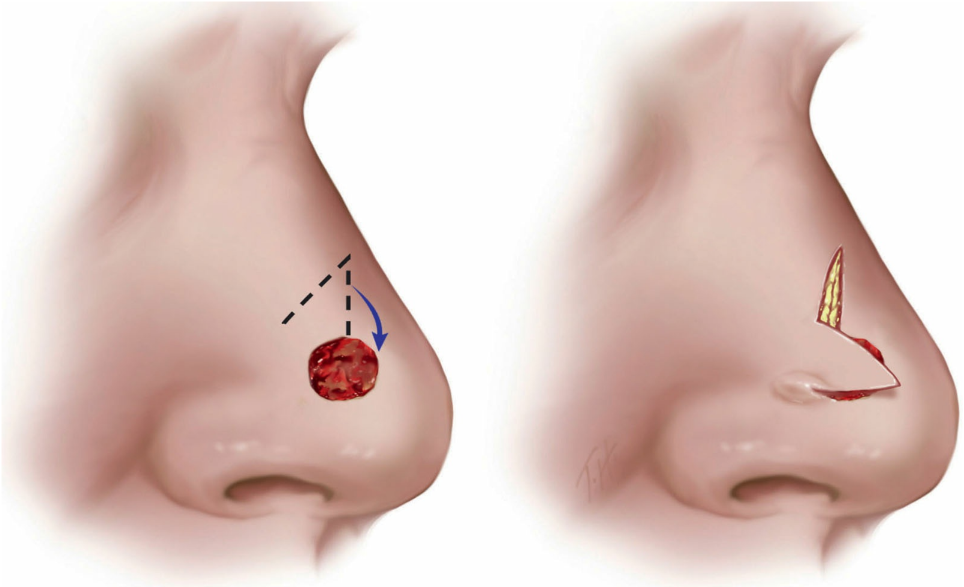


Figure 5.1B. Design of a rhombic transposition flap. In the image on the left, the flap recruits tissue from more proximal portion of the nose. The “secondary defect” is the defect caused by creation of the flap. In the image on the right, closure of the secondary defect *first* allows the flap to “fall” into the surgical defect with less risk of detrimental secondary tension vectors influencing the repair. A tricone or standing cone forms at the pivot point or point of rotation as the flap is transposed.

Figure 5.1C. Rhombic transposition flap sutured into place. A tricone was excised from the point of rotation, avoiding transection into the pedicle base.

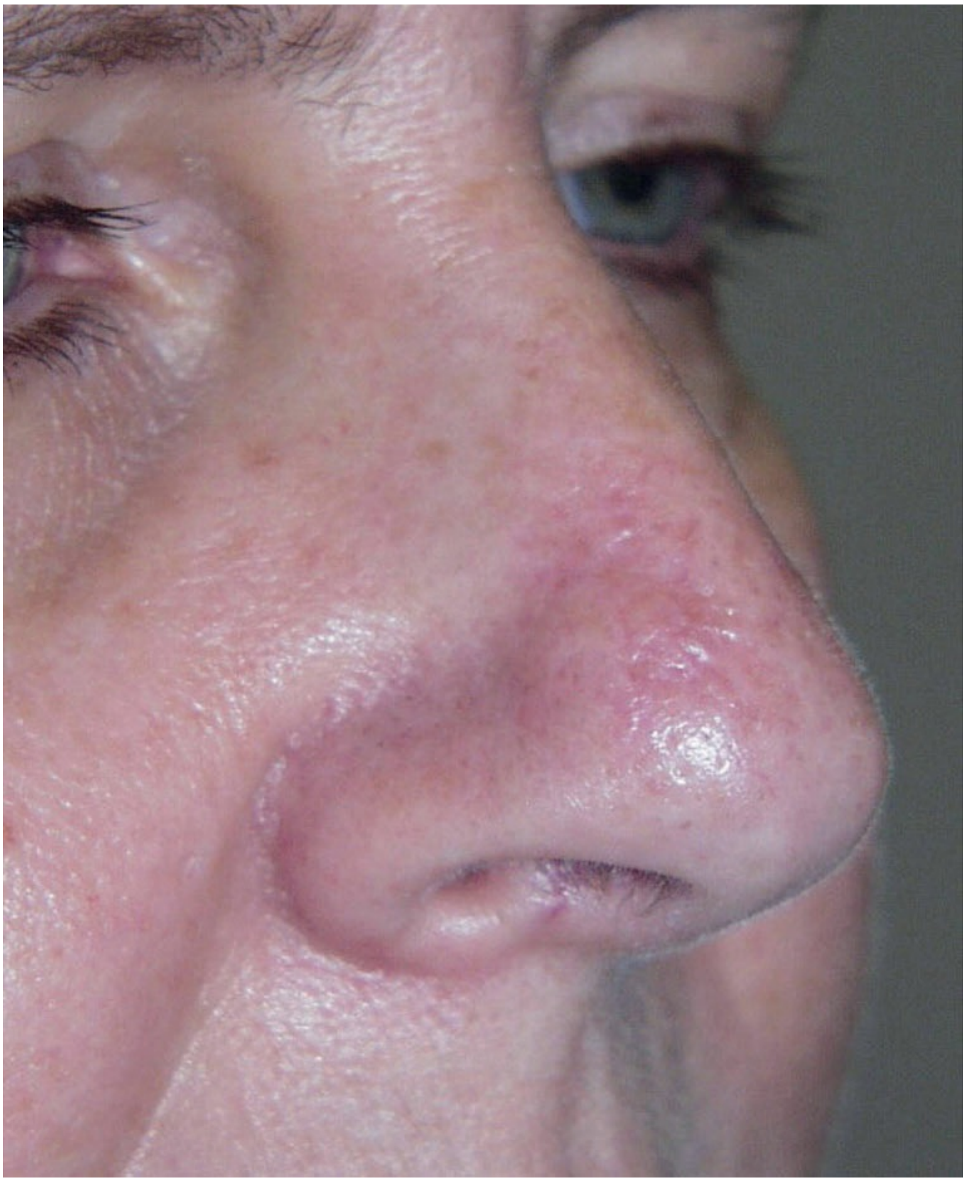


Figure 5.1D. Final healed result with good color, texture, thickness match, and avoidance of secondary tension vectors on the nasal tip or ala.

The second surgical defect is located on the right nasal dorsum and sidewall **(Fig. 5.1E)**. Although the defect in the second patient in Section 5.2 is similar, a rhombic transposition flap was selected for repair of this defect, whereas a bilateral advancement flap was selected for the repair in Section 5.2. The key is to evaluate each situation individually and choose what works best for that particular case. When evaluating as to what is missing and where the loose tissue is, the answer for both defects is the same: the loose skin is on the proximal nose or on the lateral nose and medial cheek. In this case, the surgical defect is a little larger; a bilateral advancement flap would have been a bit more difficult, and the patient has had previous surgeries in this location with the repair recruiting tissue

from the nasal sidewall (see vertical scar on nasal dorsum above current surgical defect). As a result, there is relatively less loose tissue from which to borrow on the nasal sidewall and cheek in comparison to what is available on the more proximal nose (i.e., superior nasal dorsum and nasal root). A rhombic transposition flap reconstructed the surgical defect with the closure of the secondary defect falling close to the junction of the nasal dorsum and sidewall and avoiding excessive pull on the medial canthus or lower eyelid **(Figs. 5.1F and G)**.

Finally, the third example contrasts nicely with the first example. Both defects are similar in size and located on the nasal supratip; however, one is repaired with a lateral-based rhombic transposition flap **(Figs. 5.1A–D)** and the other, a medial-based rhombic transposition flap **(Figs. 5.1H–J)**. Choice of a medial versus lateral pedicle is illustrated well by the idiom "the devil is in the details." The defect in the first example is slightly more anterior than the defect in the third example. As a result, in the first example, a lateral-based rhombic transposition flap can transpose into the surgical defect without affecting the alar crease (and underlying internal nasal valve). On the other hand, a lateral-based flap in the third example could cause excessive tissue to develop at the pivot point located in proximity to the internal nasal valve. A better choice for the slightly more posterior defect in the third example would be a medial-based rhombic transposition flap, which would allow the flap to transpose into the surgical defect without affecting the internal nasal valve. Remember, first, what is missing has to be decided; second, the location of the loose tissue from which to borrow has to be determined; and third, the method in which the tissue has to be moved to the surgical defect while hiding scars and avoiding secondary problems has to be chosen (e.g., margin or landmark deviation, or in this case potential impact upon the internal nasal valve). In this third case, we designed a medial-based flap to successfully reconstruct the defect and avoid secondary complications.

Figure 5.1E. Surgical defect following removal of recurrent skin cancer on nasal dorsum and sidewall.

Figure 5.1F. Rhombic transposition flap recruits loose tissue from the proximal portion of the nose, where the greatest loose tissue is available. Design of the flap is created such that closure of the secondary defect falls at the junction of the nasal dorsum and sidewall. Excision of tricone (dog ear) angles away from the pedicle.

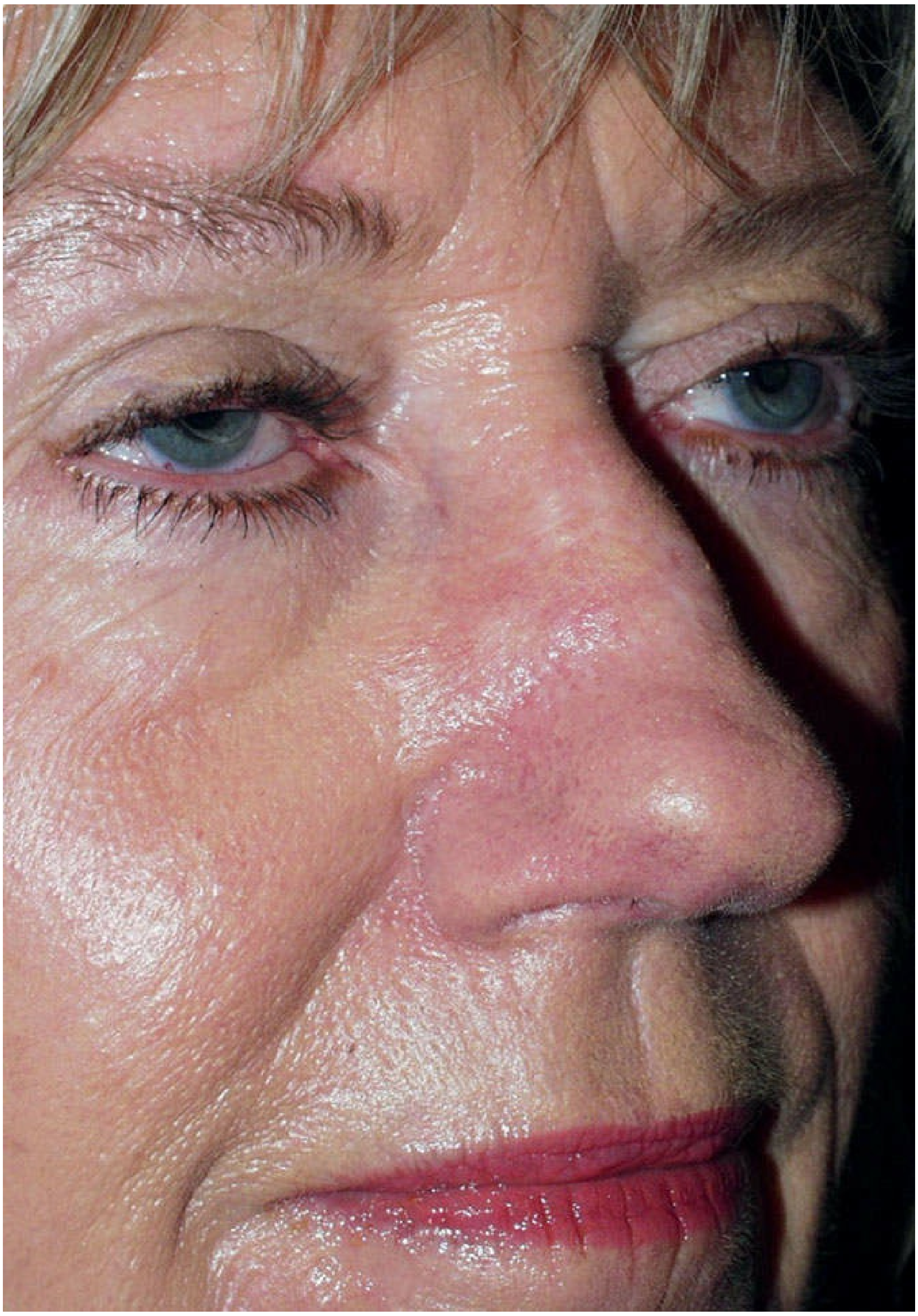


Figure 5.1G. Final healed result.

Figure 5.1H. Surgical defect on the nasal supratip (or anterior alar crease) measures 1.0 × 0.9 cm.

Figure 5.1I. Medial-based rhombic transposition flap reconstructs the surgical defect. In comparison to a lateral-based flap (see **Figs. 5.1A–D**), for a slightly more posterior defect, a medial-based flap avoids development of excessive tissue over the alar crease and internal nasal valve. Also, note how excision of the tricone angles away from the pedicle, protecting the blood supply of the flap.

Figure 5.1J. Healed appearance at 9 months.

Key Points

- Rhombic transposition flaps may be useful on the distal two-thirds of the nose for small- to medium-sized defects too large for side-to-side repair. Transposition flaps work best to redirect secondary tension vectors (in comparison to advancement and rotation flaps).
- Closure of the secondary defect first is important in execution of transposition flaps.

- Remain flexible in the design of your flap. Some defects are best repaired with a medial-based flap, some with a lateral-based flap, and some perhaps with a flap whose pedicle is superior to the surgical defect.
- Excision of the tricone should angle away from the pedicle and avoid cutting into the pedicle and blood supply of the flap.

5.2 NASAL DORSUM, MID: BILATERAL ADVANCEMENT FLAP

Although transposition flaps are good on the lateral aspect of the nose, bilateral advancement or bilateral rotation flaps may work best for defects located more centrally. The rationale behind this is that transposition flaps borrow from one side of the nose, whereas bilateral advancement or bilateral rotation flaps borrow from both sides. As a result, transposition flaps may cause some asymmetry when the patient is viewed head-on. This is because tissue is recruited on one side of the nose only. In bilateral advancement or bilateral rotation flaps, tissue is recruited from both sides (i.e., donor sites are bilateral), thereby helping to maintain nasal symmetry.

The first surgical defect measures approximately 1.8 × 1.5 cm and is located on the midnasal dorsum **(Fig. 5.2A)**. A bilateral advancement flap was designed, recruiting tissue bilaterally from the nasal sidewalls. Two incisions were made from the inferior aspect of the surgical wound bilaterally onto the nasal sidewalls. The flaps were undermined by blunt dissection to the junction of the nose and cheek in order to facilitate advancement of the flaps **(Fig. 5.2B)**. Tricones were excised from the distal (i.e., lateral) aspect of the two incisions to help mobilize the flaps centrally **(Fig. 5.2C)**. By advancing the flaps centrally, absorbable buried vertical mattress sutures were used to secure the flaps into place, and a nonabsorbable, half-buried horizontal mattress suture (i.e., “tip” suture) was used to secure the two tips of the flap to the inferior incision line. Several other absorbable, buried vertical mattress sutures were placed to approximate wound edges and remove tension from the closure. Once the flaps were advanced and sutured into place, a tricone or standing cone was excised from the superior aspect of the surgical wound **(Figs. 5.2D and E)**.

Figure 5.2A. Medium-sized surgical defect on the midnasal dorsum.

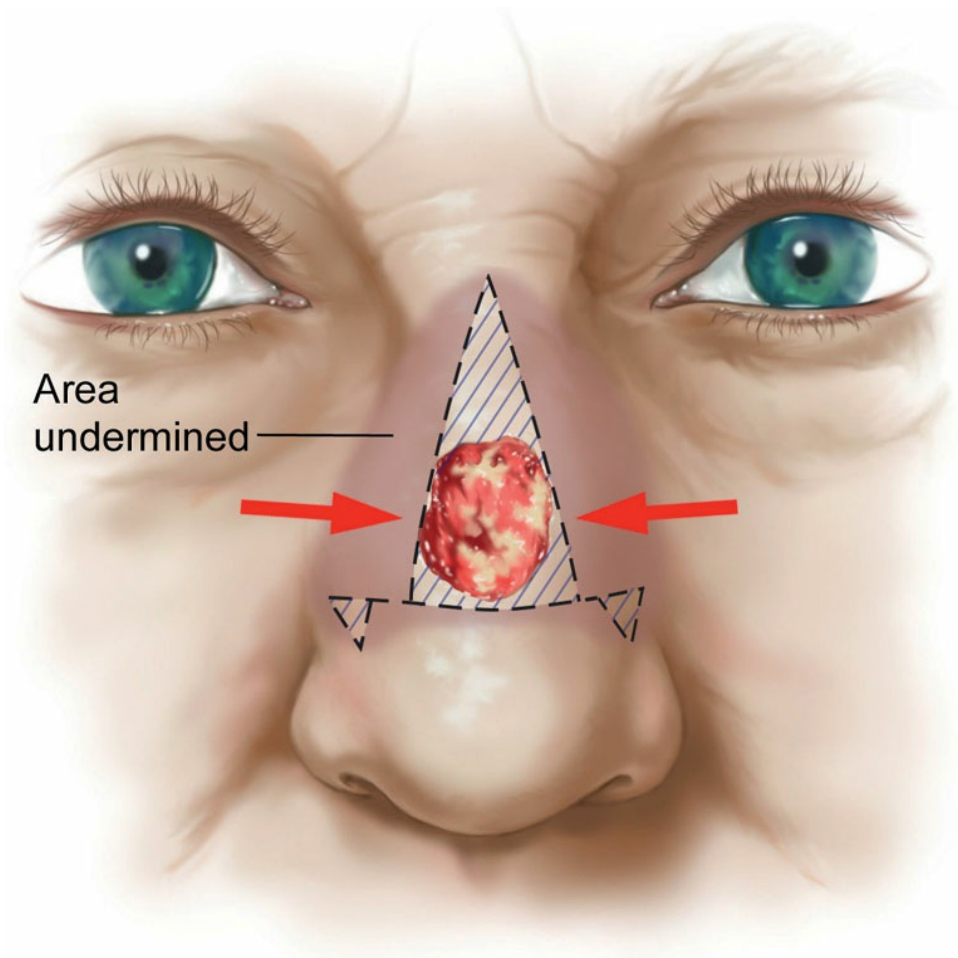


Figure 5.2B. Diagram of the bilateral advancement flap. Dashed lines indicate incisions; hash marks (i.e., diagonal lines) indicate areas removed (e.g., tricone excisions), and shaded areas indicate undermined areas (make sure to continue undermining to junction of nose and cheek). Note that tissue is sacrificed at base of defect so that advancing flaps meet cleanly, and also note that excision of tricones is superior to alar crease to avoid impact on internal nasal valve (if surgical defect was more inferior and flap and tricones might affect internal nasal valve, a bilateral rotation flap might be considered, such as Section 5.5).

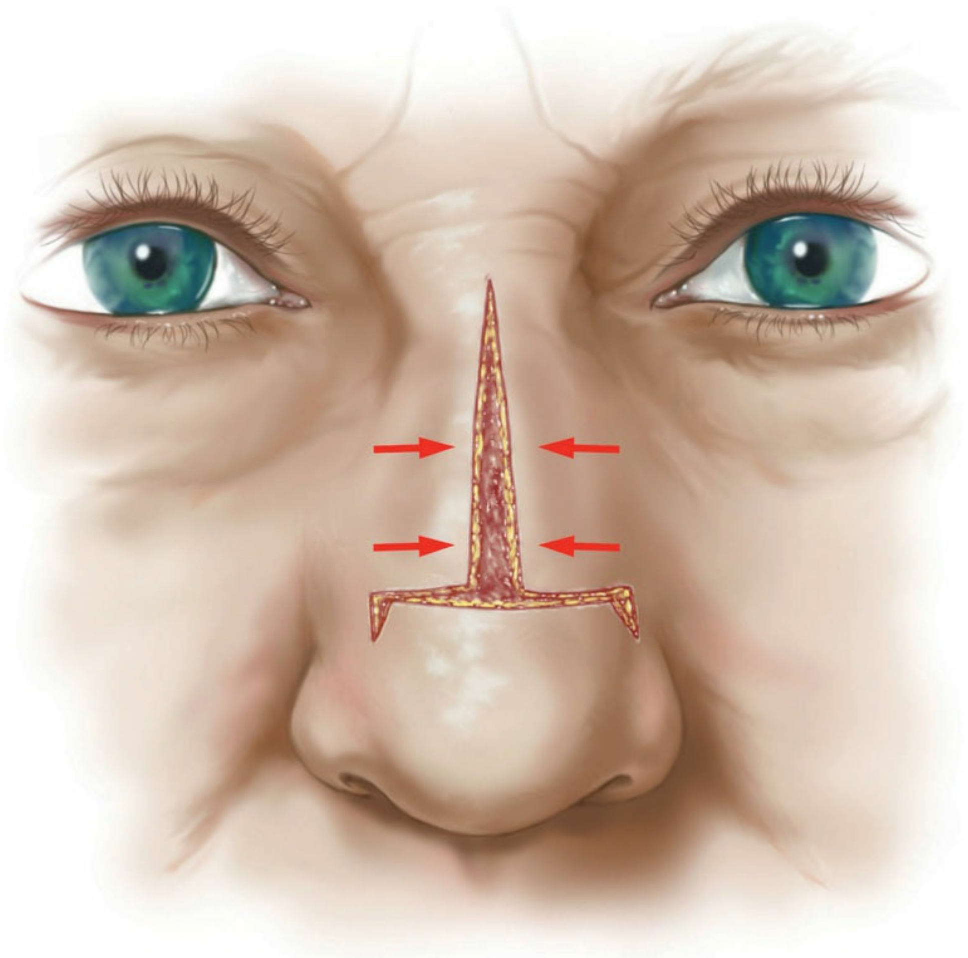


Figure 5.2C. After adequate undermining in submuscular plane on the nose (subcutaneous plane on the lateral nasal sidewall and cheek) and removal of tricones, flaps are advanced centrally and sutured into place. A half-buried horizontal mattress suture (“tip suture”) is used to secure the tips of the flaps to the midportion of the horizontal incision.

Figure 5.2D. Appearance immediately after repair.

Figure 5.2E. Final healed result.

The second case illustrates a similar example in a young woman with a 1.5 × 1.3 cm defect on the right nasal dorsum after Mohs micrographic surgery for a basal cell carcinoma **(Fig. 5.2F)**. A bilateral advancement flap was performed, and the healed result demonstrates the appearance 3 months after surgery **(Figs. 5.2G and H)**. In review, a significant amount of tissue can be recruited bilaterally from the nasal sidewalls (carry undermining to the cheek to recruit the greatest loose tissue), and by “sharing” from where tissue is recruited, symmetry of the nose may be better maintained.

Figure 5.2F. Surgical defect on the right nasal sidewall and dorsum.

Figure 5.2G. Repair by bilateral advancement flap. Avoid pressure or incision onto the alar crease, which could affect the internal nasal valve.

Figure 5.2H. Final healed result.

Key Points

- Consider bilateral advancement flaps for defects on the midnasal dorsum or supratip, rather than a rhombic or bilobed transposition flap. Sharing from where the donor tissue is recruited helps to maintain nasal symmetry.
- Undermine widely on the nasal sidewall and medial cheek, and incorporate tricone excisions to facilitate advancement of the flaps

centrally.

- In advancement flaps, first advance and secure the flaps into the surgical defect (in contrast to transposition flaps where the secondary defect is closed first). Follow this with closure of the tricones and secondary defects.

5.3 NASAL SIDEWALL AND NASOMELAL FOLD: ISLAND ADVANCEMENT FLAP

Available adjacent loose tissue for this first surgical defect would include the medial cheek as well as the area superior to the surgical defect on the nasal root and glabella **(Fig. 5.3A)**. An island advancement flap was chosen to reconstruct this surgical defect, recruiting tissue from the convex nasomelal cheek or nasomelal fold **(Fig. 5.3B)**. When using island advancement flaps, it is preferable to place at least one of the long sides of the triangle within a rhytid or boundary between cosmetic units or subunits. In addition, because of the central pedicle and lack of cutaneous attachment, these island flaps may develop some mild trapdooring or pincushioning. On a convex surface such as the nasomelal cheek, that is not generally a problem; however, in other locations, use of absorbable buried vertical mattress sutures around the periphery of the island flap will help to minimize trapdooring by maintaining tension around the periphery of the flap.

After the triangular flap is incised, the flap is mobilized by careful blunt and sharp dissection, starting at the leading and trailing edges. Undermining continues along the sides of the flap so that a healthy vascular pedicle is maintained in the central body of the flap while being mobilized adequately to advance into the surgical defect with minimal tension. At this point, the leading edge is secured to the superior-medial aspect of the surgical defect with absorbable buried vertical mattress sutures (e.g., 4-0 polyglactin 910). The secondary defect is closed and the long sides of the triangle similarly secured with buried absorbable sutures. The epidermis is approximated and everted with a nonabsorbable running percutaneous suture (e.g., 6-0 polypropylene).

An important point when using these types of advancement flaps for surgical defects near the medial canthus, eyelid, or any free margin is to

make sure the advancement of the flap and subsequent secondary tension vectors do not pull back or distort the free margin of the eyelid or medial canthus. In both of these examples, the flap was directed toward the medial aspect of the defect to avoid secondary tension vectors on the medial canthus of the eye **(Figs. 5.3C and D)**.

Figure 5.3A. Surgical defect on the right nasal sidewall adjacent to the cheek and nasomelal fold measures 1.7 × 1.6 cm.

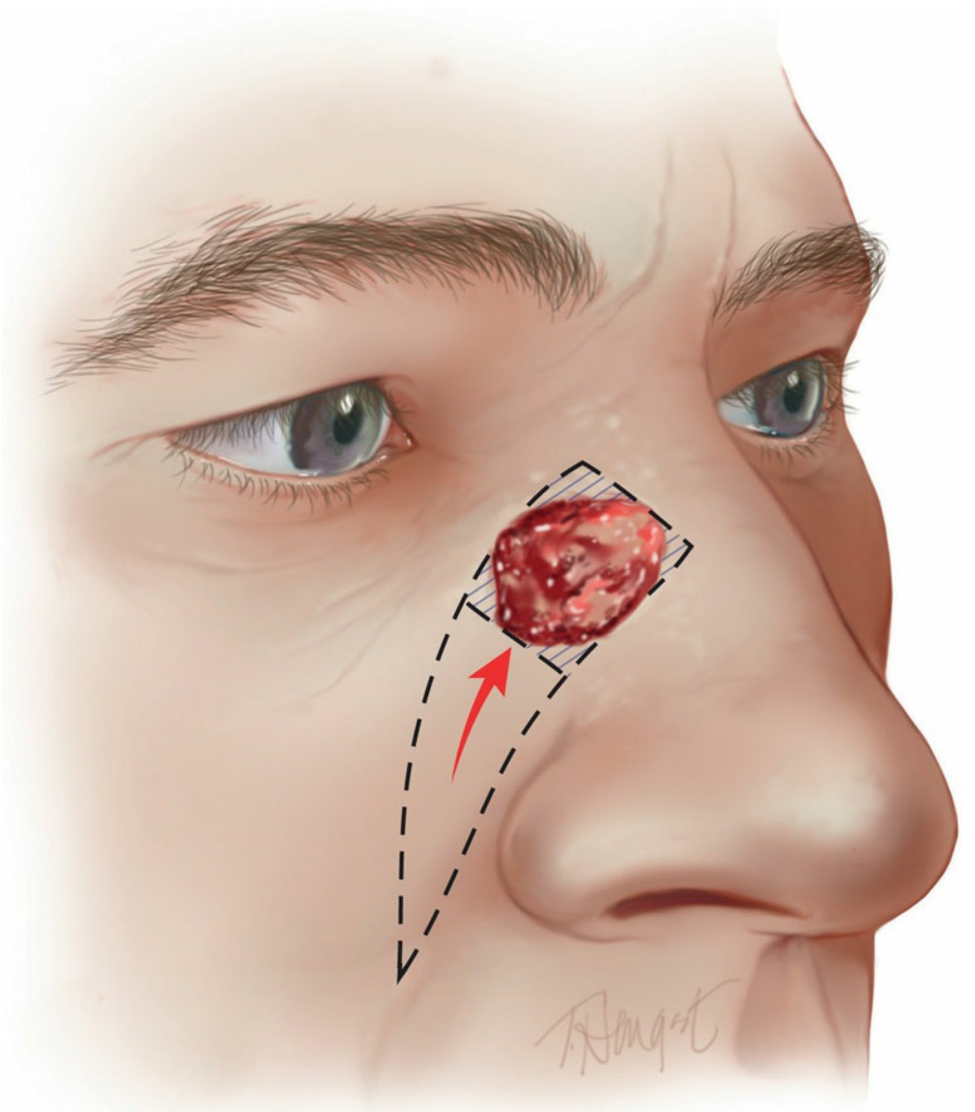


Figure 5.3B. Design of an island advancement flap. Wound edges may be "squared off" to allow precise fit of the flap within the defect and perhaps decrease risk of trapdooring (hash marks indicate tissue excised to permit clean wound edge approximation or "precise" fit). One long side of the triangular flap is best placed within a rhytid or furrow or at the junction of cosmetic units. In this case, the flap follows the junction of the nasomelal fold to the nasomelal furrow, avoiding blunting of the isthmus between the cheek, nose, and lip (i.e., the alar sill). A lack of cutaneous connection and careful undermining while preserving the vascular pedicle makes this flap particularly mobile. The vascular pedicle sits closer to the base of the triangle with the leading edge undermined enough to prevent bulldozing (pulling downward) of the triangular base (i.e., advancing edge of the flap). After adequate mobilization, the flap is advanced into the surgical wound and sutured into place, avoiding movement and secondary tension vectors on the medical canthus or lower eyelid.

Figure 5.3C. An island advancement flap utilized to move tissue into the surgical defect. To minimize pull on the medial canthus, the flap was directed superiorly *and* medially so that secondary tension vectors would not pull the medial canthus downward. One long side of the triangular flap follows the border of the convex portion of the nasomelal cheek toward the nasomelal furrow.

Figure 5.3D. Healed result. Note fullness to flap appropriate for this area, and incision lines fairly well hidden.

In the second example, the surgical defect measures 2.3 × 1.6 cm in diameter following Mohs surgical excision of a basal cell carcinoma **(Fig. 5.3E)**. The defect sits at the junction between the nose and the cheek. As in the first example, one of the long sides of the triangular island advancement flap extends into the nasomelal furrow and avoids blunting of the junction between the cheek, nose, and lip (i.e., alar sill). The flap is advanced superiorly and medially, and avoids secondary tension vectors on the medial canthus or lower eyelid **(Fig. 5.3F)**. The patient underwent scarabrasion with a hand engine and coarse pear-shaped diamond fraise at

2 months following surgery to soften the transition between the scar and surrounding sebaceous skin. Mild trapdooring or pincushioning developed, which was treated with intralesional triamcinolone (10 mg/cc) each month for 3 months. The final healed view at 6 months demonstrates how well the flap has reconstructed this area and the benefit of considering ancillary treatments, such as intralesional steroids or dermabrasion, in the postoperative period for select cases **(Fig. 5.3G)**.

Figure 5.3E. Surgical defect on the nasomelal fold measures 2.3 × 1.6 cm.

Figure 5.3F. An island advancement flap recruits tissue from the convex nasomelal cheek or nasomelal fold. One long side of the triangular flap follows the inferior junction of the nasomelal fold into the nasomelal furrow and avoids blunting of the alar sill. Placement of the incision at the junction helps hide the subsequent healed scar.

Figure 5.3G. Six-month healed appearance. Prior to this result, patient received three monthly intralesional injections of triamcinolone (10 mg/cc, approximately 0.5 cc each time) into the portion of the flap that had developed mild trapdooring, and the patient was instructed to massage the same area (e.g., for 1 minute 8 to 10 times each day). Use of pressure or massage and a short course of intralesional steroids may help to resolve trapdooring or pincushioning. To soften the appearance of the scar with the surrounding sebaceous skin, scarabrasion with a hand engine and coarse pear-shaped diamond fraise was performed. Scarabrasion is carried to a depth approximating the junction of the papillary and reticular dermis, clinically noted as fine pinpoint bleeding. Similar results may be seen using an ablative or fractionated laser for "laserbrasion."

Key Points

- Island advancement flaps work best when one long side of the triangular flap can be placed within a rhytid, furrow, or cosmetic unit/subunit junction.

- Movement or direction of advancement flaps, including island advancement flaps, should avoid secondary tension vectors on free margins, such as the lower eyelid.
- With no cutaneous attachment island, advancement flaps may have a higher risk of trapdooring or pincushioning. Placement of absorbable buried sutures around the flap may help mitigate trapdooring and scar contracture centrally.
- As in the case of other select repairs, intralesional steroids may be helpful to counter the effect of hypertrophic scars or keloids, and scarabrasion may soften the transition between the surgical scar and surrounding sebaceous skin.

5.4 NASAL SIDEWALL AND SUPRATIP: BILOBED TRANSPOSITION FLAP, LATERAL PEDICLE

A surgical defect like this one on the nasal sidewall and supratip is well suited for a transposition flap repair such as a bilobed transposition flap **(Fig. 5.4A)**. Rhombic flaps are useful for nasal defects of up to about 1.0 cm in diameter, but the upper limit size may be lesser for defects located within the distal one-third of the nose (e.g., nasal tip and ala). Bilobed transposition flaps are useful for defects of up to about 1.5 cm in diameter in this region. A surgical defect of this size and location repaired by a rhombic flap requires that a larger area be recruited *immediately* adjacent to the surgical defect. Recruiting a larger share of tissue immediately adjacent to the distal one-third of the nose may cause some depression on the nasal sidewall or nasal asymmetry. A better option may be to use a bilobed transposition flap and “walk” the tissue downward from the more proximal portion of the nose, where there is a greater abundancy of recruitable tissue.

In this case, as the defect is relatively *anterior* on the nose (i.e., closer to the midline than the cheek), a lateral-based pedicle was used, and the flap was designed so that the excised tricone would sit just above the alar crease **(Figs. 5.4B–D)**. For defects more posterior on the nose, a medial-based pedicle would be considered (see Section 5.9).

Figure 5.4A. Surgical defect on the right nasal sidewall and supratip measures 1.1 × 1.0 cm.

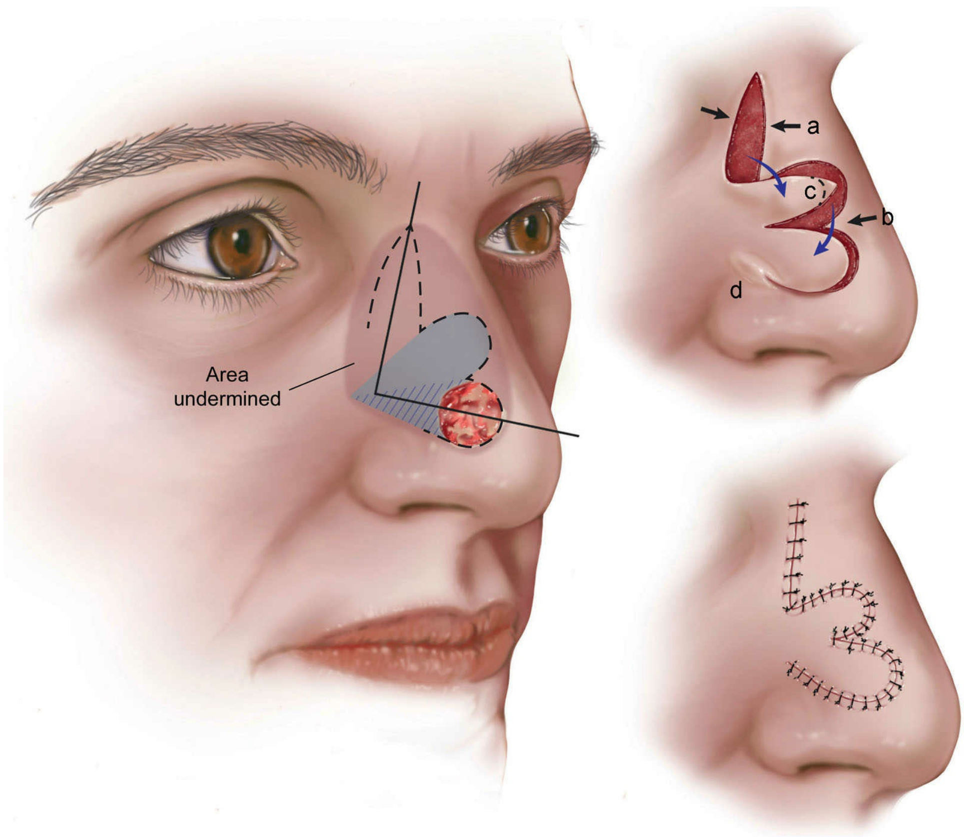


Figure 5.4B. Design of lateral-based bilobed transposition flap. The flap is heart-shaped or cordiform (gray shaded area in diagram). Each lobe should be the same size and approximately 45 to 50 degrees between the surgical defect and first lobe and between the first and second lobes. After the flap is incised and undermining and hemostasis is complete, the first sutures should close the tertiary defect ("**a**" in the upper right hand diagram). Next, the cleft between the two lobes is secured in position ("**b**"). Finally, the flaps are trimmed as needed and sutured ("**c**"), and the tricone is excised and sutured ("**d**"). (Hash marks indicate tricone excised.)

Figure 5.4C. Bilobed transposition flap sutured into place.

Figure 5.4D. Final healed view.

Most present-day bilobed transposition flaps are based on the article by Zitelli (The bilobed flap for nasal reconstruction. Arch Dermatol, 1989;125(7):957-959), which described his modification of the bilobed transposition flap originally designed by Esser. Zitelli's modification included two similar-sized lobes with a maximum angle of 45 to 50 degrees between each lobe and the excision of a tricone at the point of rotation.

The bilobed transposition flap has been referred to as a “workhorse” for nasal reconstruction. At the same time, it seems to be one of the more intimidating and easily bungled flaps for nasal repair. Although no facial repair is as simple as a cookbook recipe, there are specific design elements and techniques that help to ensure success. The author’s preference for design and completion of a bilobed transposition flap can be simplified as follows, which should make the flap less frightening and more straightforward **(Fig. 5.4B)**.

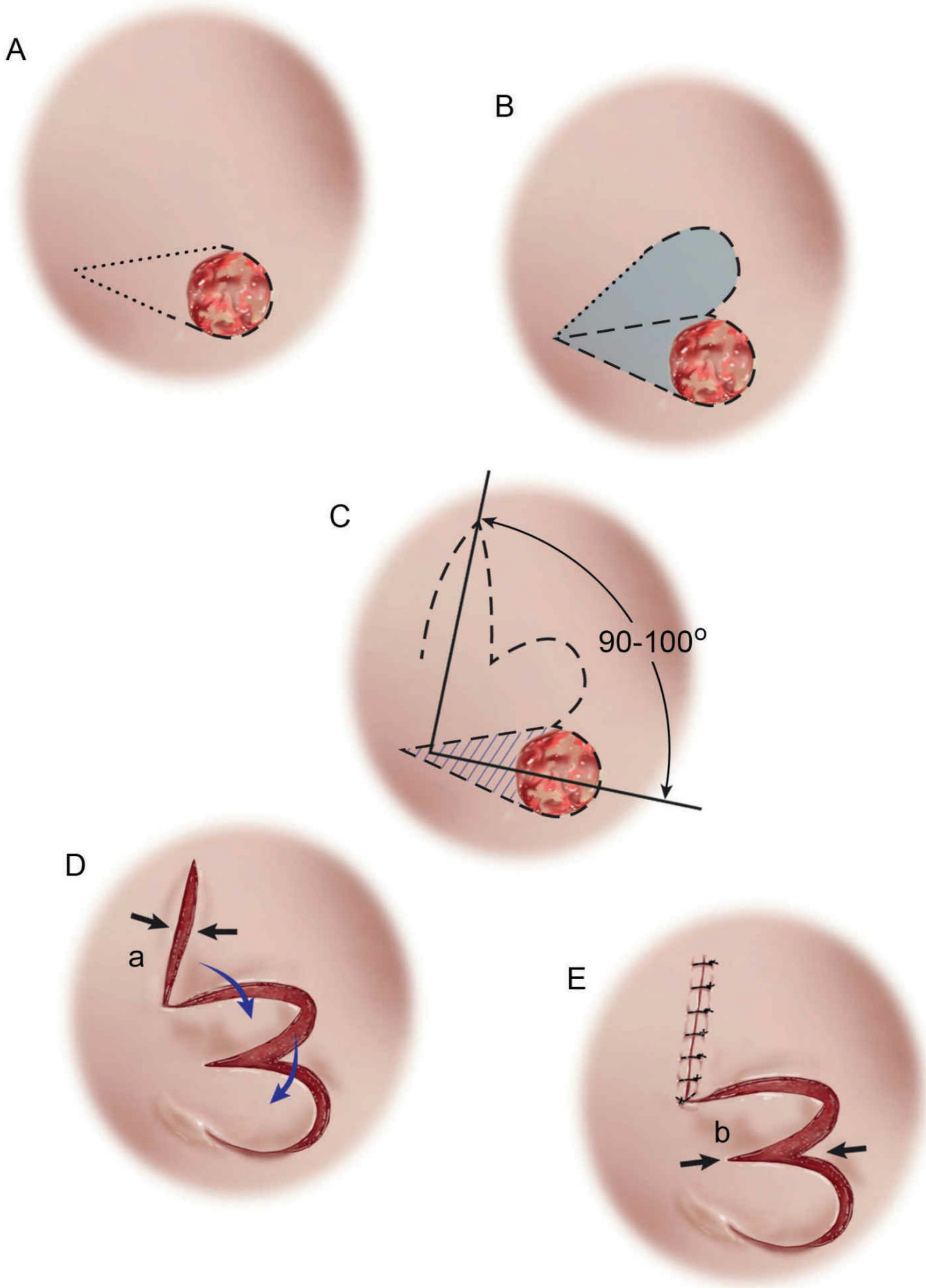
STEP-BY-STEP BILOBED TRANSPOSITION FLAP, LATERAL PEDICLE

5.4.1 Step-By-Step: Bilobed Transposition Flap

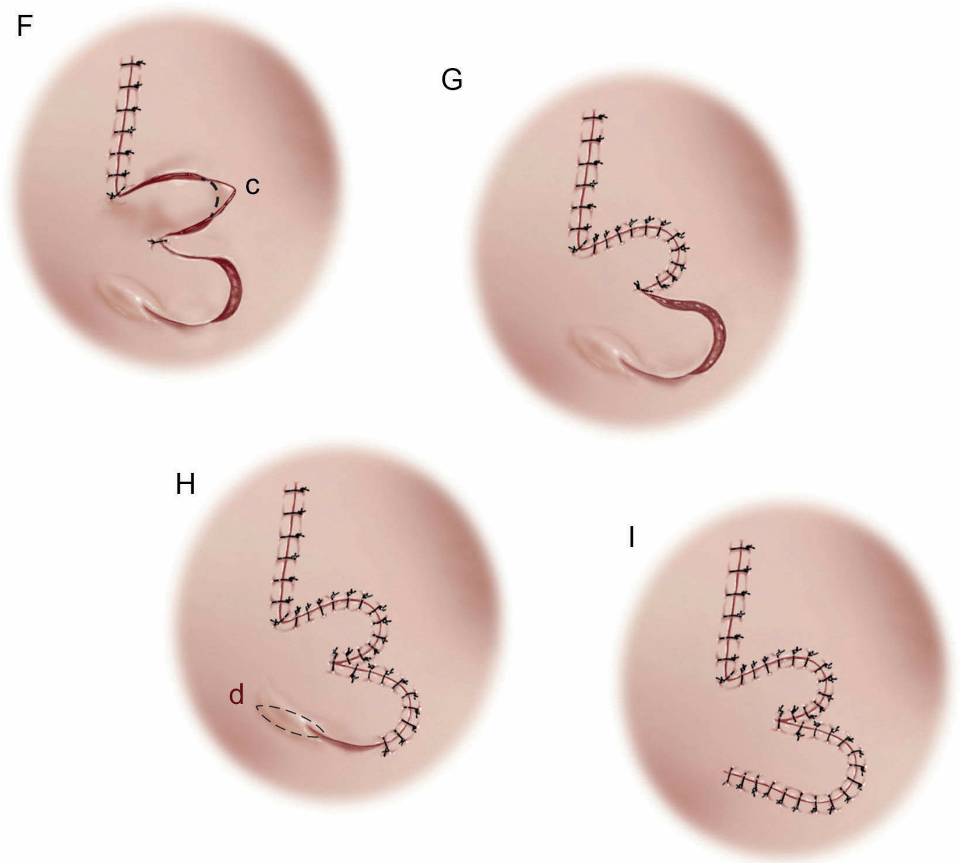
1. **Choose between a medial-based and a lateral-based pedicle to the flap.** The bilobed transposition flap is most useful for reconstruction of defects on the distal one-third of the nose, primarily the **lateral** aspect (e.g., nasal ala, alar crease, lateral tip, lateral supratip, and sidewall). For defects on the lateral nasal tip or supratip, a lateral pedicle for the bilobed flap is preferred **(Figs. 5.4B and C)**. For defects on the nasal ala or posterior sidewall, a medial-based pedicle flap works best to keep the flap within one cosmetic subunit, avoid nasal valve dysfunction, and preserve symmetry (see Section 5.9).
2. **Plan placement of the tricone for excision.** Near the end of the repair, a tricone will be excised to minimize tissue protrusion at the point of rotation. At the start of the design for a lateral-based pedicle, the tricone is drawn out to avoid crossing the alar crease, which would affect the airflow past the internal nasal valve **(Fig. 5.4E “A”)**. Usually, the tricone is designed such that the inferior incision sits just at or above the alar crease (for lateral pedicle flaps and some medial pedicle flaps) or at the junction between the nasal tip and supratip (for some medial pedicle flaps, e.g., Section 5.9). Placement of the tricone at these locations minimizes visibility of the scar and helps to determine the next step of the flap, orientation and design of the two lobes of the flap.
3. **Design the two lobes of the flap.** The first lobe of the flap (adjacent to the defect) should be the same size as the defect and located at approximately 45 to 50 degrees arc rotation from the tip of the tricone.

First described in a scientific lecture by Kunishige and Zitelli as "heart" shaped, this cordiform design illustrates the need for the first lobe to be identical in size to the defect and the angle between the lobes to be approximately 45 degrees **(Fig. 5.4E "B")**.

The second lobe should be the same distance from the first lobe (i.e., 45 to 50 degrees), and the width of the second lobe should approximate the width of the first lobe **(Fig. 5.4E "C")**. Discrepancies between these two angles (i.e., defect → first lobe vs. first lobe → second lobe) and between the width of the lobes can result in distortion of the alar rim or other free margins or anatomical landmarks. For example, if the angle between the defect and the first lobe is 45 degrees and the angle between the first lobe and the second lobe is 65 degrees, the flap will tend to push the defect (and nearby alar rim) downward **(Fig. 5.4G)**. The defect and the alar rim become depressed in this scenario because the second lobe has been placed at a greater arc and distance from the first lobe. When the flap is sutured into place, the lobes of the flap will have a tendency to maintain this angle between them, resulting in depression of the alar rim and nasal asymmetry. A similar effect upon the alar rim is possible if the size of the first lobe is greater than the surgical defect. Conversely, if the arc between the defect and the first lobe is greater than that between the first and the second lobe, the defect (and free margin) will be elevated **(Fig. 5.4H)**. Similarly, a first lobe sized too small for the defect will have a tendency to elevate the alar rim. For these reasons, accurate lobe sizing and arcs of rotation are critical for success of bilobed flaps.



► **Figure 5.4E.** "A" Determine and mark out tricone location. "B" Cordiform or heart-shaped design of the first lobe with the surgical defect and tricone. "C" Second lobe is located equidistant from first lobe (each angle 45 to 50 degrees and each lobe same diameter as defect). "D" After widely undermining and incision of flap, close tertiary defect first ("**a**"). "E" After tertiary defect is closed, a key suture is placed in the cleft between the two lobes ("**b**"), securing both lobes in proper position for further trimming and suturing.



► **Figure 5.4F.** “F” The second lobe may be trimmed (“**c**”), and additional buried absorbable sutures are used to fix the lobes of the flap into place. “G” The epidermis may be further approximated and everted with nonabsorbable sutures. “H” Secondary to transposition of the flap, a standing cone develops, which will be removed (“**d**”). “I” The tricone is excised, angling away from the vascular pedicle of the flap. The remainder of the flap is closed with nonabsorbable sutures.

The second lobe should taper to approximately a 30-degree angle to avoid protrusion of tissue and should minimize secondary tension vectors on free margins, such as the lower eyelid **(Fig. 5.4E “C”)**.

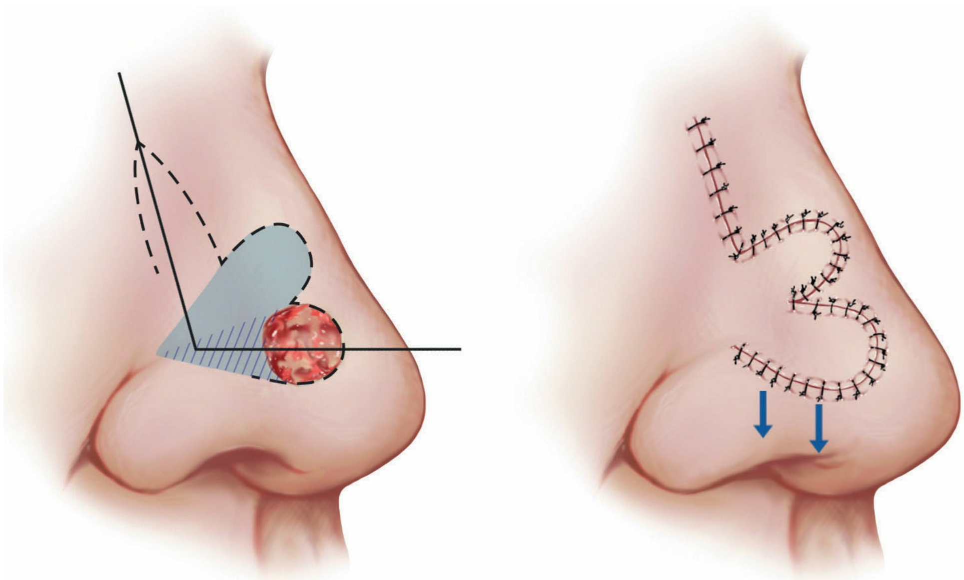
4. **Undermine widely by blunt and sharp dissection.** At this point, the area beneath the designed flap and the surrounding tissue is undermined by blunt and sharp dissection. Undermining is performed before the flap is incised because it helps to determine the depth to which the incision is carried out. Over the nasal dorsum and sidewalls, undermining and subsequent incision is carried to a submuscular plane, whereas onto the lateral or posterior sidewall and medial cheek, the undermining is carried out to the subcutaneous plane. Difficulties in adequate transposition or reach of the flap are frequently related to inadequate soft tissue undermining and release of fibrous attachments, especially on the side of the pedicle.

5. **Debevel wound edges (if appropriate) and incise flap to undermined plane.** If the surgical defect is the result of Mohs micrographic surgery, the edges should be made perpendicular with the skin surface. The flap is incised to the plane of undermined tissue (i.e., submuscular vs. subcutaneous). Undermining is further continued to ensure flap movement is not restricted and that the site of the second lobe (i.e., tertiary defect) can be closed primarily without undue tension.
6. **Hemostasis.** Hemostasis is achieved by light spot electrodessication to bleeding points.
7. **Close tertiary defect first.** The tertiary defect (i.e., donor site of the second lobe) is closed *first* in a side-to-side fashion with 4-0 absorbable buried vertical mattress sutures to take tension off the wound edges (**Fig. 5.4E "D,"** black arrows marked "**a**"). Skin edges are approximated and everted with 6-0 nonabsorbable simple interrupted or running percutaneous sutures. Closure of the tertiary defect *first* is an act of paramount importance in this and other transposition flaps. It allows the flap to proceed to the defect unimpeded and permits minor tailoring of the flap to be made subsequently **(Fig. 5.4E "D,"** blue curved arrows demonstrate transposing flaps**)**.
8. **Suture the cleft area between the two lobes.** This *key* suture places the two lobes in a neutral position so that the final flap tailoring and suturing can proceed **(Fig. 5.4E "E,"** black arrows marked "**b**").
9. **Tailor flaps to fit and final suturing.** The second lobe will need to be trimmed to fit the donor site of the first lobe and the first lobe may need minor tailoring to fit the surgical defect precisely **(Fig. 5.4F "F")**. The flap should only fill the defect. Sometimes, the first lobe might have been estimated to be slightly larger than that needed for the defect, and the flap will need minor trimming of width or length to properly fit the defect. If the flap crosses the alar crease, absorbable tacking suture or sutures may be used to better approximate the flap to the concave alar crease. In these instances, the suture is placed with the loop in the direction of the long axis of the flap to minimize potential ligation of vascular branches to the distal aspect of the flap. The flap is approximated to wound edges of the surgical defect with absorbable buried vertical mattress sutures.
10. **Excise tricone at point of rotation.** The tricone can be excised, and

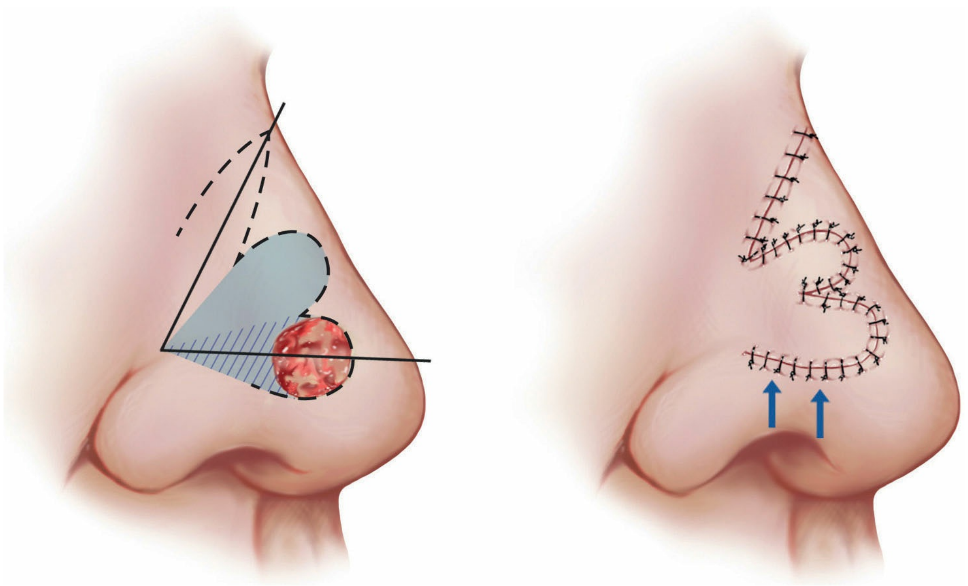
any bleeding can be carefully cauterized for hemostasis. Although some people prefer to excise the tricone when the flap is initially incised, the author prefers to remove it after placement of the key suture and the first few sutures securing the first lobe **(Fig. 5.4F "H")**. This ensures proper placement of the flap and avoids potential impact of skin thickness and elasticity as well as consequence of surgical defect depth. Removal of the tricone as well as tailoring of the second lobe is best reserved near the end of the procedure. When possible, excision of the tricone should angle away from the pedicle to protect the vascular supply (**Fig. 5.4F "H,"** dashed area marked by "**d**").

11. Finally, remaining wound edges are approximated and everted with nonabsorbable, simple interrupted or running sutures **(Fig. 5.4F "I")**. Pressure bandages are applied, and if pressure on the flap causes collapse of the nasal ala or crease, nasal packing is inserted for 24 hours.

5.4.2 Examples of Poor Design and Discrepancies of Angles Between Lobes



► **Figure 5.4G.** Discrepancy in angles between the defect and each lobe can have a negative impact on repair. In this case, the angle between the first and second lobe is significantly greater than the angle between the defect and the first lobe. As a result, when sutured into place, the flap will have a tendency to push the alar rim downward. Similar results can occur when lobes of flap are too large.



► **Figure 5.4H.** Another example where discrepancy in angles between the surgical defect and each of the lobes can have a negative impact on flap success. The angle between the first and second lobe of the flap is significantly less than the angle between the defect and the first lobe. As a result, the alar rim can be pulled upward. A similar result may be seen if the lobes are too small.

5.4.2.1 EXAMPLE OF PROPER BILOBED TRANSPOSITION FLAP DESIGN

The second example involves a surgical defect on the right nasal tip and supratip **(Fig. 5.4I)**. As the defect is located on the anterior aspect of the side of the nose, a lateral-based pedicle was chosen with the tricone placed above the alar crease. A defect more posterior on the side of the nose (e.g., nasal ala, alar crease, or sidewall) would have been considered for a medial-based pedicle (see Section 5.9). A heart-shaped or cordiform designed flap ensures the first lobe of the flap is the same size as the defect and contains a 45-degree arc of rotation from the tip of the tricone. The second lobe is also similar-sized and another 45 degrees away, but this lobe tapers to a 30-degree angle to facilitate closure of the tertiary defect. The total arc of rotation for the two flaps is 90 degrees, and the tricone is excised at or just superior to the alar crease **(Fig. 5.4J)**. The flap reconstructs depth well and resurfaces with skin of similar color, texture, and sebaceous quality. By keeping the flap and donor site on the same side as the defect, the scars are well hidden and kept within one cosmetic unit **(Figs. 5.4K and L)**.

►**Figure 5.4I.** Surgical defect of the right nasal tip and supratip measures 1.1 × 1.1 cm.

► **Figure 5.4J.** As the defect is more anterior on the side of the nose, a lateral-based pedicle was selected and the location of the tricone was placed at or just superior to the alar crease. Respectively, these characteristics keep most of the repair in one cosmetic subunit and avoid incisions or tissue movement over the alar crease, which would negatively affect airflow past the internal nasal valve.

► **Figure 5.4K.** Oblique view of the healed cosmetic result.

▶ **Figure 5.4L.** Full-face view of healed results show good symmetry and incision lines/scars kept on one side of the nose within one cosmetic result. Had the surgical defect been more midline, a bilateral rotation flap would have been considered for reconstruction (e.g., **Fig. 5.5**).

Key Points

- Bilobed transposition flaps are useful for defects on the lateral one-third of the nose up to about 1.5 cm in diameter.
- Proper and uncomplicated design of the flap includes incorporation of tricones, cordiform-shaped flap, precise angles and flap sizes, and adequate undermining.

- Closure of the tertiary defect first followed by placement of a key suture in the cleft between the two lobes places the flap in the appropriate neutral position for final tailoring and suturing.

5.5 NASAL TIP, MID: BILATERAL ROTATION FLAP

For midline defects on the nasal tip or supratip, a bilateral rotation flap may be a good alternative for reconstruction **(Figs. 5.5A and E)**, and for midline defects located more superiorly on the nasal dorsum, a bilateral advancement flap may work well (e.g., Section 5.2). Both types of repair borrow tissue bilaterally for centrally located surgical defects. In this current example, a transposition flap, such as a bilobed transposition flap, would have recruited tissue only from one side and as a result, would have created a paucity of skin and soft tissue on the donor side compared to the other, resulting in nasal asymmetry when the patient is viewed head-on.

The key objective with a bilateral rotation flap is to recruit enough tissue to repair the defect but to avoid creating secondary defects and secondary tension vectors that cause significant long-term distortion of the nasal tip or alae. As such, this type of repair is particularly well suited for larger noses or older patients—situations where there is a relative abundance of loose tissue or laxity. In fact, because of age-related nasal tip ptosis, some older patients note improved nasal air flow secondary to slight tip elevation following the repair. Even in younger patients or smaller noses, the repair is useful as long as it is used for small- to medium-sized defects and the amount of rotation and secondary defect sizes are modest.

In design of the bilateral rotation flap, the flaps should extend inferiorly to the edge of the surgical defect if possible **(Fig. 5.5B)**. For defects on the inferior aspect of the tip or the nasal infratip, the flaps may not be able to start at the inferior border of the defect, and the flaps may arise from within the lower half of the defect. The closer to the inferior border that flaps arise, lesser the tendency for nasal tip or alar rim lifting. Whenever possible, the curvilinear incisions should follow the junctions between cosmetic subunits. For the distal portion of the flaps, the incisions are just medial to the alar crease at the junction between the nasal tip and ala. As the incisions proceed superiorly, they follow the junction between the nasal dorsum and sidewall and continue to a point within the nasomelal fold that connects to the nasal sidewall. A tricone is excised at the

proximal portion of each flap within the nasomelal fold, avoiding excision at or immediately adjacent to the alar crease, where there is comparatively less loose tissue and where tricone excision could affect nasal air flow at the internal nasal valve. Excision of these tricones and wide undermining of the flaps and areas around the tricone excisions facilitate the advancement of the flaps downward, and advancement of the flaps will allow rotation of the flaps centrally. However, to facilitate mobilization before the flaps are rotated into the surgical defect, the defects created by excision of the tricones are closed with absorbable sutures. After repair of the tricone excisions, the flaps are rotated centrally and secured together with one or two buried absorbable sutures. A nonabsorbable, half-buried horizontal mattress suture (i.e., “tip suture”) may be used at the tips to attach the flaps to the central inferior portion of the defect. Next, additional absorbable sutures are placed along the arcs of the flaps, closing the secondary defects. A standing cone forms superior to the defect when the flaps are rotated centrally, and this is carefully excised, minimizing injury to vascular supply. Finally, the epidermis is approximated and everted with a nonabsorbable, running percutaneous suture **(Figs. 5.5B–D and F–H)**.

Bilateral rotation flaps may be useful in other central facial locations, such as the superior forehead (e.g., Section 4.7), chin, or lower lip vermilion (e.g., Section 6.6). In these instances, distribution of secondary tension vectors on both sides of the surgical defect and placement of arciform incisions at the junction of cosmetic units or subunits help optimize the final cosmetic result.

Key Points

- Bilateral rotation flaps may be useful for small- to medium-sized surgical defects on the nasal tip and supratip and help to avoid nasal asymmetry that may be seen with transposition flap repair.
- Incisions from bilateral rotation flaps start at the inferior aspect of the wound and continue on the lateral nasal tip or supratip bilaterally for a maximum angle of 90 degrees on each side. The incisions follow the junction between cosmetic subunits and continue to the nasomelal fold, where there is loose tissue. At the distal point of each incision, a tricone of tissue is excised, facilitating advancement and rotation of the flaps centrally.
- Undermine well in the submuscular plane beneath the flaps and

pedicles to assist in flap movement.

- The key point with this flap is to use it judiciously and avoid secondary defects and tension vectors that might cause long-term distortion of the tip or nasal alae.

Figure 5.5A. Midline defect on the nasal tip measures 1.2 × 1.0 cm.

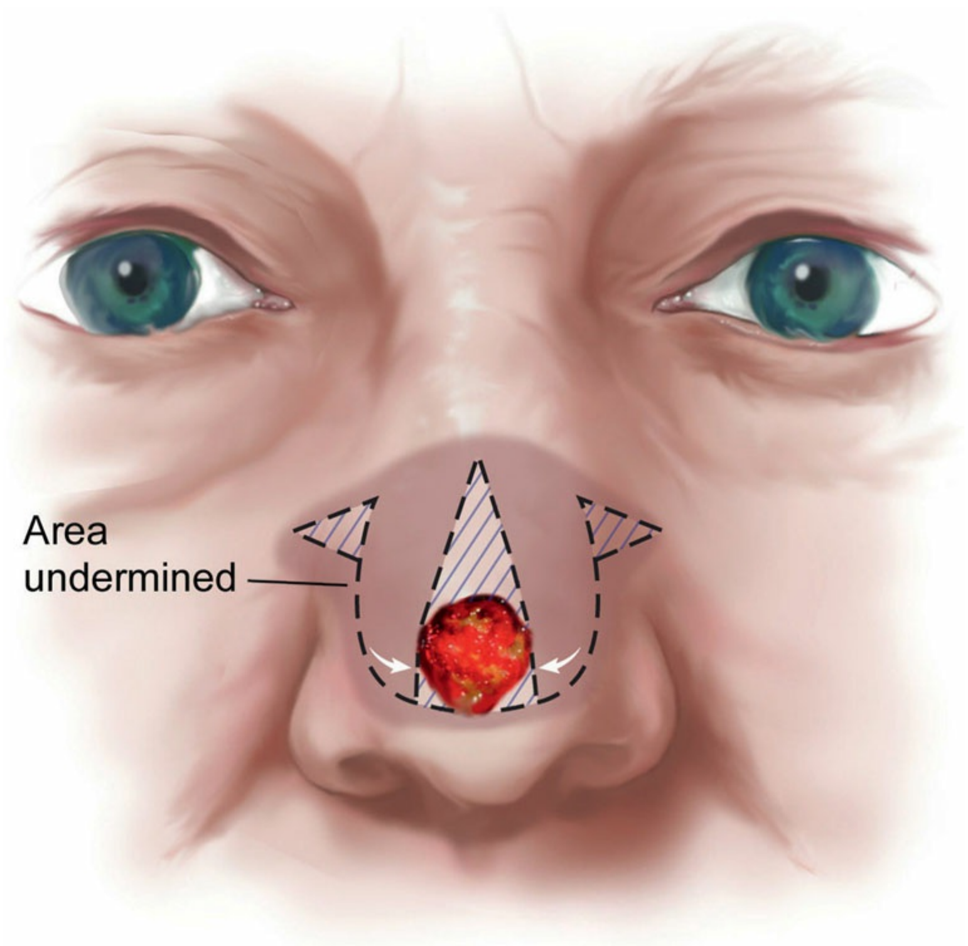


Figure 5.5B. Design of the bilateral rotation flap. Flaps arise at or near the inferior border of the surgical defect. A small area at the inferior aspect of the surgical defect may have to be trimmed bilaterally so that flap edges may approximate cleanly (cross-hatched or diagonal lines at inferior border of defect). The curvilinear incisions follow the junction between nasal tip and ala (just medial to alar crease) and continue along the junction between nasal dorsum and sidewall. Incisions end where the nasomelal fold meets the nasal sidewall, and an adequate tricone is excised bilaterally, avoiding proximity to the alar crease (tricones indicated by triangles with diagonal lines bilaterally). Wide and complete undermining in the submuscular plane around the flap, pedicle, and tricone excision sites mobilize the flaps for advancement and rotation. The tricones are closed first, which facilitates advancement and rotation of the flaps. The flaps are rotated centrally and secured into place, and the remaining secondary defects along the curvilinear incisions are closed. A tricone is excised superior to the surgical defect (midline triangle with diagonal lines), and the epidermis is closed around the flaps.

Figure 5.5C. Postoperative appearance. A bilateral rotation flap recruits tissue and redistributes secondary tension vectors, causing a slight lift to the nasal tip and alae. (If properly designed and executed for small- to medium-sized defects, most of the obvious significant edema and lifting is secondary to immediate postsurgical effect and local anesthesia and will resolve in the first 48 hours.)

Figure 5.5D. Final healed result. Slight nasal tip and alar lift has settled. Incision lines are well hidden at junction of nasal tip and alae.

Figure 5.5E. Surgical defect on the midnasal supratip measures 1.3 × 1.2 cm.

Figure 5.5F. A bilateral rotation flap reconstructed the nasal supratip.

Figure 5.5G. Final healed result demonstrates nasal symmetry.

Figure 5.5H. Oblique view demonstrates incision lines that are well hidden at junction of nasal dorsum and sidewall.

5.6 ALAR CREASE, ANTERIOR: FULL-THICKNESS SKIN GRAFT, AND SCARABRASION

Concave areas heal well by second intention healing, but for defects near anatomical landmarks or free margins the small amount of scar contraction may cause aesthetic or functional problems. Similarly, for a defect on the alar crease, a suboptimal result can cause decreased air flow on inspiration

because of the impact of inflexible scar tissue on the internal nasal valve, which is situated deep to the alar crease. In the first case, the relatively superficial defect was repaired with a full-thickness skin graft **(Figs. 5.6A–C)**. One benefit of the graft repair is that it limits scar contracture in comparison to second intention healing. Another benefit to graft repair is that no additional incision lines are created (in contrast to flap repair). Some patients prefer a graft repair over a flap repair because they wish to avoid potential additional incision lines at any cost, even for a repair where the color, thickness, and texture of the skin may be slightly different.

Figure 5.6A. Surgical defect on the right anterior alar crease.

Figure 5.6B. Full-thickness skin graft sutured into place. Graft is sutured into place with 5-0, fast-absorbing gut running percutaneous suture. Slits are made in the graft to prevent fluid accumulation between the graft and wound bed. Several polypropylene sutures are placed around the periphery to be used for a tie-down dressing.

Figure 5.6C. Final healed result.

The second example demonstrates a larger defect on the right anterior alar crease and lateral nasal tip **(Figs. 5.6D–F)**. Based on the size and location of the defect, this would be a challenging local flap repair and would likely best be approached by an interpolation flap from the cheek or forehead. Flaps can also be less successful for defects over concave areas as they can create a fullness or bridging across the concave area (for example, think about blunting that can occur for melolabial transposition flaps that cross the alar crease to repair the nasal ala). The particular defect in this second

example is relatively shallow, and much of it is located in a concave area. When you see defects in concave areas, remember to consider second intention healing or graft repair. Because of the proximity to the alar rim and nasal tip, second intention healing would not be a good alternative. In performing the graft repair, this defect was slightly enlarged so that incision lines were better in line with junctions between cosmetic subunits. The most common donor sites for graft repairs on the nose are the preauricular and postauricular skin. Finally, the other benefit of graft repairs is the lack of additional incision lines and scars. No matter how well healed, some fastidious patients and some defects are better repaired with a procedure that does not cause additional incisions and scars **(Figs. 5.6G–I)**.

Key Points

- Full-thickness skin grafts are most useful on superficial concave or flat surfaces or when the patient or surgeon prefers a repair that will not add additional incision lines and scars to the nose.
- Grafts should be thinned of all fat and subcutaneous tissue and well approximated to the wound bed. Tacking sutures and/or tie-down dressings help to approximate the graft to the wound bed and may increase graft survival.

Figure 5.6D. Surgical defect on the anterior alar crease and lateral nasal tip measures 1.8 × 1.2 cm.

Figure 5.6E. A full-thickness skin graft sutured into place with 5-0, fast-absorbing gut running percutaneous suture, tacking sutures to hold the graft to the wound bed, slits or fenestrations in the graft to prevent blood or serum building up between graft and wound bed and polypropylene sutures to be used for a tie-down dressing.

Figure 5.6F. Final healed result.

Figure 5.6G. Another example is a surgical defect in an area where a graft might not be the first repair considered. This surgical defect on the left nasal ala measures 0.9 × 0.6 cm, and the patient was hesitant to undergo flap reconstruction. The convex nature of the anatomical subunit is not a location that most would consider for graft reconstruction. At the same time, flaps require additional incisions and tissue movement, and the patient would likely not be satisfied with iatrogenic scars and potential risk of asymmetry or impact on nasal air flow.

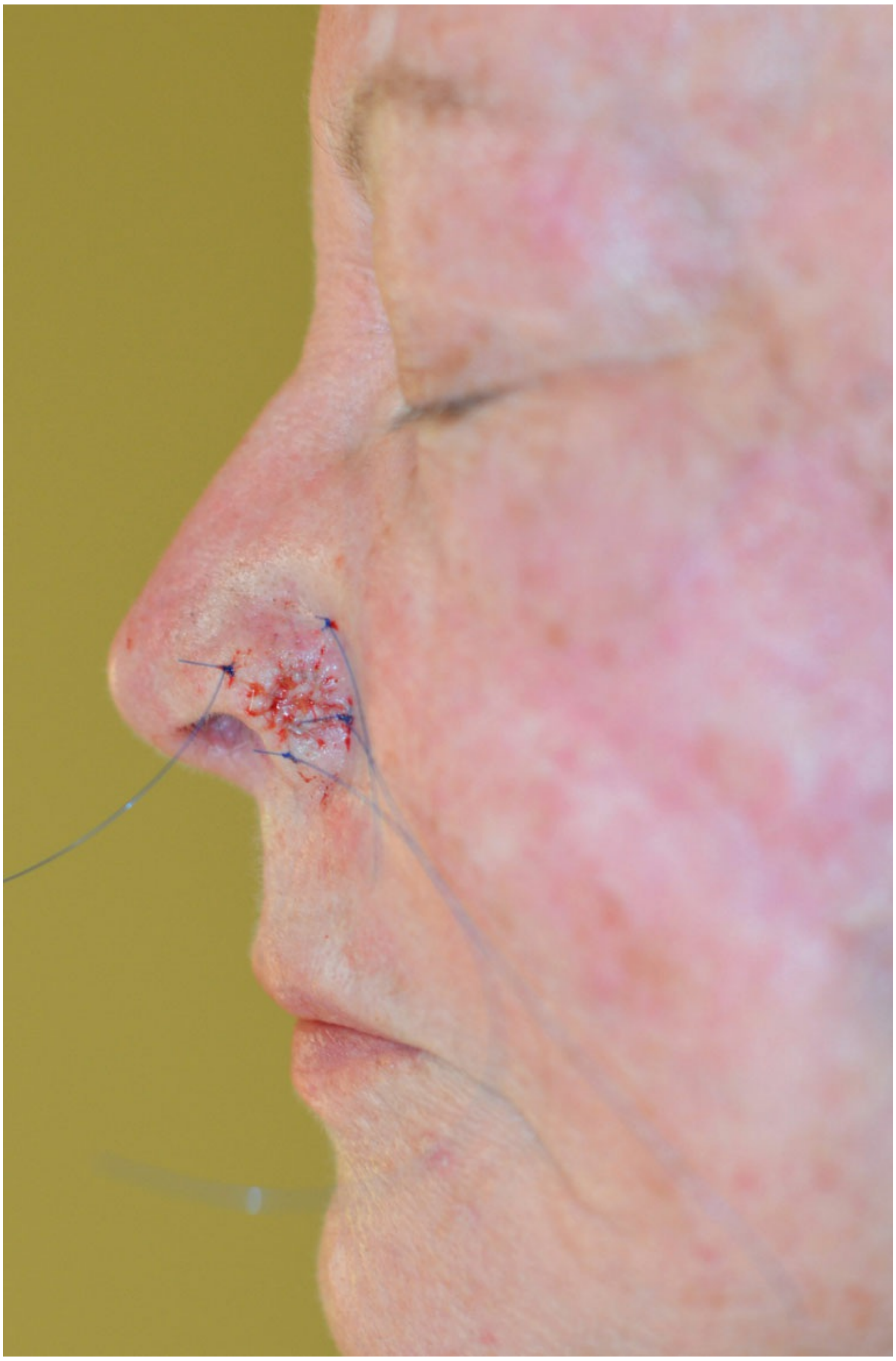


Figure 5.6H. Full-thickness skin graft sutured into place. A 5-0, fast-absorbing gut running percutaneous suture and tacking suture were used to secure the graft. Several 5-0 polypropylene sutures are placed around the graft to hold a tie-down dressing in place.

Figure 5.6I. Final healed result with good aesthetic result. Although graft repair is not usually the first option considered in this location, it provided an excellent cosmetic result and satisfied the patient's requirements.

5.7 ALAR CREASE, ANTERIOR: ISLAND ADVANCEMENT FLAP

A good option for small defects on the alar crease or superior nasal ala adjacent to the crease is an island advancement flap **(Figs. 5.7A and D)**. This small, triangle-shaped mobile flap may be a good alternative for

defects too deep for graft repair in this location. One of the key points to this repair is that the long sides of the triangle should *gradually* taper so there is no significant abrupt upward deviation of the nasal ala. Design and implementation is similar to other forms of island advancement flaps (see Sections 3.3, 5.3, and 6.4). The flap is carefully mobilized and advanced into the surgical defect where it is sutured into place **(Figs. 5.7B, C and E, F)**. Mobilization of the flap in this location does not require a lot of work; just make sure that an adequate vascular pedicle is maintained. One good aspect of this flap in this location is that it is a sliding or advancement flap, whereas transposition flaps overlying the internal nasal valve may create excessive soft tissue bulk, affecting the internal nasal valve.

Key Points

- Island advancement flaps may be useful for small defects on the ala or alar crease too deep for second intention or graft repair.
- The long sides of the triangular flap should be long and tapering, avoiding abrupt termination within or near the alar crease.
- The flap should be carefully mobilized by blunt dissection of flap edges while preserving a central subcutaneous pedicle (see also Section 6.4).

Figure 5.7A. This 75-year-old female was left with a 0.7 × 0.6 cm defect on the anterior alar crease following Mohs micrographic surgery for a basal cell carcinoma.

Figure 5.7B. Island advancement flap sutured into place. Take care in blunt and sharp dissection of flap, permitting adequate mobilization of flap but not jeopardizing vascular pedicle.

Figure 5.7C. Final healed result.

Figure 5.7D. Surgical defect on the midportion of the alar crease measures 1.3 × 1.0 cm.

Figure 5.7E. Island advancement flap sutured into place. Use of this adjacent tissue with a similar concave surface may help decrease the risk of blunting the alar crease as may be seen at times with transposition flap repair.

Figure 5.7F. Short-term healed result at 2 months. (Note: Patient was 1 pack-per-day cigarette smoker, which may cause delay in wound healing or partial flap necrosis.)

5.8 ALAR CREASE AND POSTERIOR NASAL ALA: RHOMBIC TRANSPOSITION FLAP

Another alternative for defects on the alar crease is a rhombic transposition flap. This works well for defects in the midportion of the crease, where it might be difficult to slide an island advancement flap from one side or the

other, and for defects that are immediately adjacent to the nasal sidewall from where the flap will be transposed **(Fig. 5.8A)**. In the first case, one of the key points that made this flap successful was that the flap was designed so the pedicle is medial, rather than lateral. A lateral-based pedicle might have necessitated that the flap cross or impinge upon the alar crease. A medial-based pedicle permitted the flap to be transposed over the alar crease without difficulty and with less impact upon the internal nasal valve. To minimize blunting of the alar crease, a single absorbable suture was used to tack the flap to the concave wound bed, and several absorbable sutures were used around the periphery to secure the flap and minimize the risk of trapdooring or pincushioning. Another key point is that the tricone is excised downward, avoiding cutting into the pedicle and placed roughly along the anterior aspect of the alar crease, further allowing the incision to be well hidden **(Figs. 5.8B and C)**.

Figure 5.8A. Surgical defect measures 0.9 × 0.8 cm on the midportion of the alar crease.

Figure 5.8B. Rhombic transposition flap sutured into place. Closure of the donor site avoids tension on the lower eyelid and medial canthus. Excision of the tricone at the point of rotation follows the alar crease and avoids cutting into the pedicle of the flap.

Figure 5.8C. Final healed result.

Another location where rhombic transposition flaps might be useful is for defects on the posterior aspect of the nasal ala or alar crease **(Fig. 5.8D)**. Reconstructive options for this defect are somewhat limited because of the paucity of adjacent loose tissue, combined convex and concave surface topography, and complexity of the cheek and nose cosmetic unit borders. In this case, it is sometimes beneficial to look to an adjacent cosmetic unit and design a rhombic transposition flap, moving tissue from the nasomelal fold and nasal sidewall **(Fig. 5.8E)**. The complicating factor in this

situation is the intervening concave alar crease over which the flap must transpose. The best option is to close the flap's secondary defect first and then use a pexing or tacking suture to approximate the deep surface of the flap to the wound bed and secure it to the underlying periosteum. In addition, as in the case with melolabial transposition flap repairs (e.g., Section 5.10), when a flap must cross a concave surface it is wise to explain to the patient beforehand the possible need for a second procedure to better recreate the alar crease. In this instance, even without a second procedure, the transposition flap produced a quite acceptable result **(Fig. 5.8F)**.

Key Points

- For defects on the midalar crease, a medial-based rhombic transposition flap can recruit tissue from the nasomelal fold and minimize impact on the underlying internal nasal valve.
- Closure of the secondary defect should not distort anatomical landmarks or free margins. (Note in the first example: the donor site of the flap is pointed toward the medial canthus so that closure of the secondary defect does not apply tension on the lower eyelid or medial canthus.)
- Excision of the tricone should follow the direction of the alar crease and avoid cutting into the flap pedicle.
- To minimize blunting of the alar crease, absorbable sutures can be used to secure the flap to the wound bed and, if appropriate, to the underlying periosteum.
- Trapdooring or pincushioning is caused by scar contracture around the periphery of the flap and centrally beneath the flap. These effects can be mitigated by the judicious use of absorbable sutures around the periphery of the flap, securing the flap to the wound edges of the surgical defect.

Figure 5.8D. Surgical defect on the alar crease and posterior aspect of the nasal ala.

Figure 5.8E. Rhombic transposition flap from the nasomelal fold and nasal sidewall used to reconstruct defect. A pexing or tacking suture secures the flap base to the wound bed and the underlying periosteum over the maxilla.

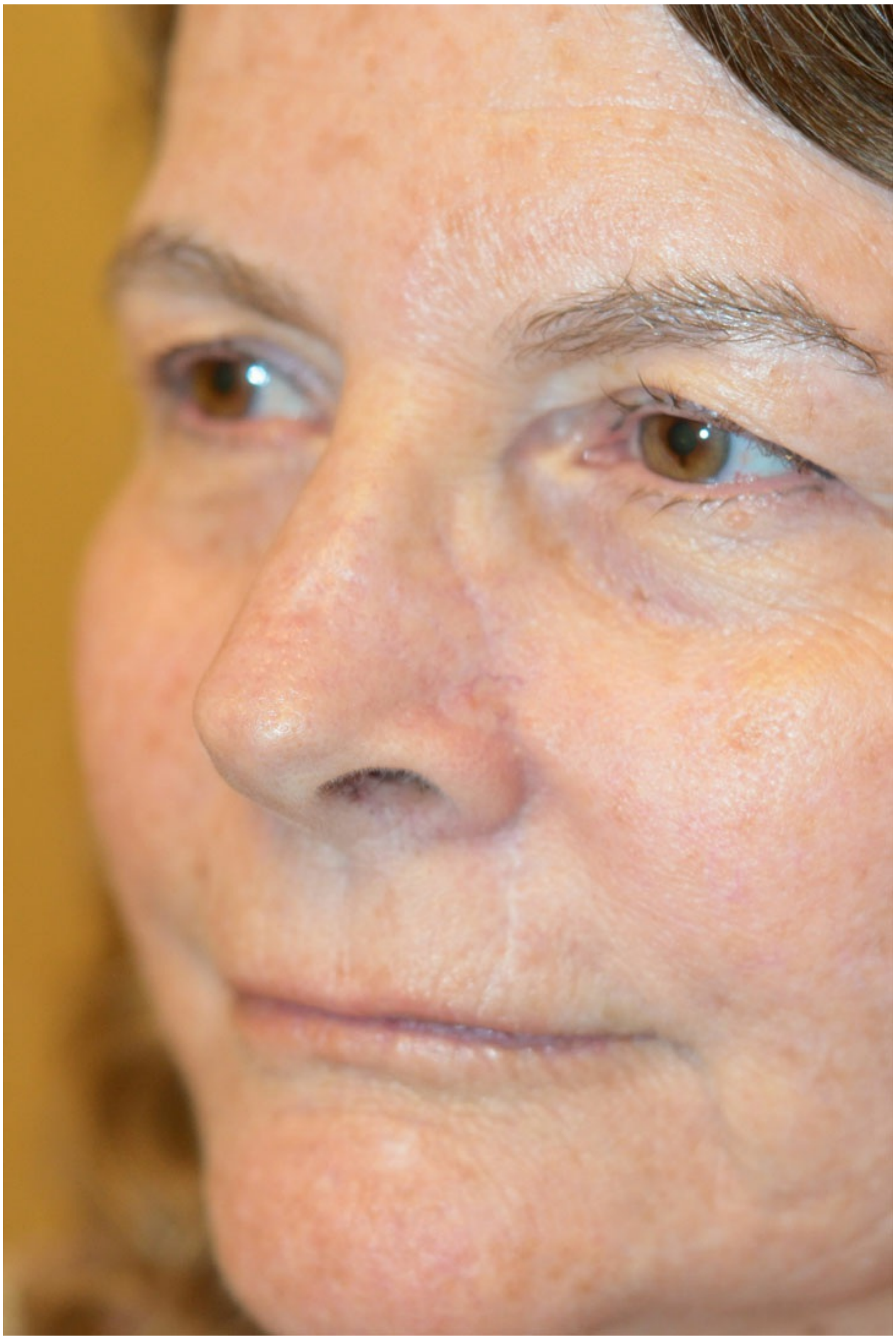


Figure 5.8F. Healed result with fairly good recreation of the convex nasal ala and concave alar crease.

5.9 ANTERIOR NASAL ALA: BILOBED TRANSPOSITION FLAP, MEDIAL PEDICLE

In contrast to Section 5.4, the surgical defect in this first case is located slightly more inferior and posterior **(Fig. 5.9A)**. As a result, a medial-based bilobed transposition flap may be a better option for repair, rather than a lateral-based pedicle **(Fig. 5.9B)**. By designing a medial-based flap,

the repair is kept in one cosmetic subunit as much as possible (e.g., nasal sidewall) and avoids impact upon the internal nasal valve. In this case, we start off by determining that a medial-based pedicle is favored because of the more posterior position of the surgical defect and also that the tricone will be placed at the junction of the nasal tip and dorsum or sidewall. Defects on the more *anterior* aspect of the side of the nose (e.g., lateral nasal tip or anterior alar crease) are best approached with a **lateral pedicle**, whereas defects on the more *posterior* aspect of the nose (e.g., nasal ala, posterior alar crease, or posterior nasal sidewall) are more easily designed with a **medial pedicle**.

After the choice of pedicle and tricone location is determined, the design of the bilobed transposition flap is fairly straightforward (see also Section 5.4 for a more detailed discussion). Briefly, the first and second lobes should be the same width as the diameter of the surgical defect and located approximately 45 to 50 degrees from each other (90 to 100 degrees total transposition from the surgical defect to the apex of the second lobe). There is a definite heart-shaped or cordiform appearance to the design, which is helpful in the planning and design of the flap (see **Fig. 5.9B**). The second lobe should taper to a 30-degree angle, and closure of the tertiary defect (i.e., origin of the second lobe) should not distort the medial canthus or eyelid. One obvious difficulty in this first example is that the defect sits partially within a concave area. As mentioned before, flaps can blunt concave areas or even develop trapdooring. The best option here would be to ensure that the flap fits properly (i.e., not too big or too small) and is meticulously sutured with absorbable sutures securing the flap to the wound edges. Further, one or two pexing sutures within the flap may be used to anchor the flap to the wound bed, a key point being that the loop of the suture follows the long axis of the flap to minimize risk to vascular supply. Finally, if pressure on the flap causes collapse of the nasal ala or alar crease, a pressure bandage with nasal packing is used for the first day to minimize swelling and decrease the risk of bleeding **(Figs. 5.9C and D)**.

Figure 5.9A. Surgical defect on the right anterior nasal ala and anterior alar crease measures 1.2 × 1.1 cm.

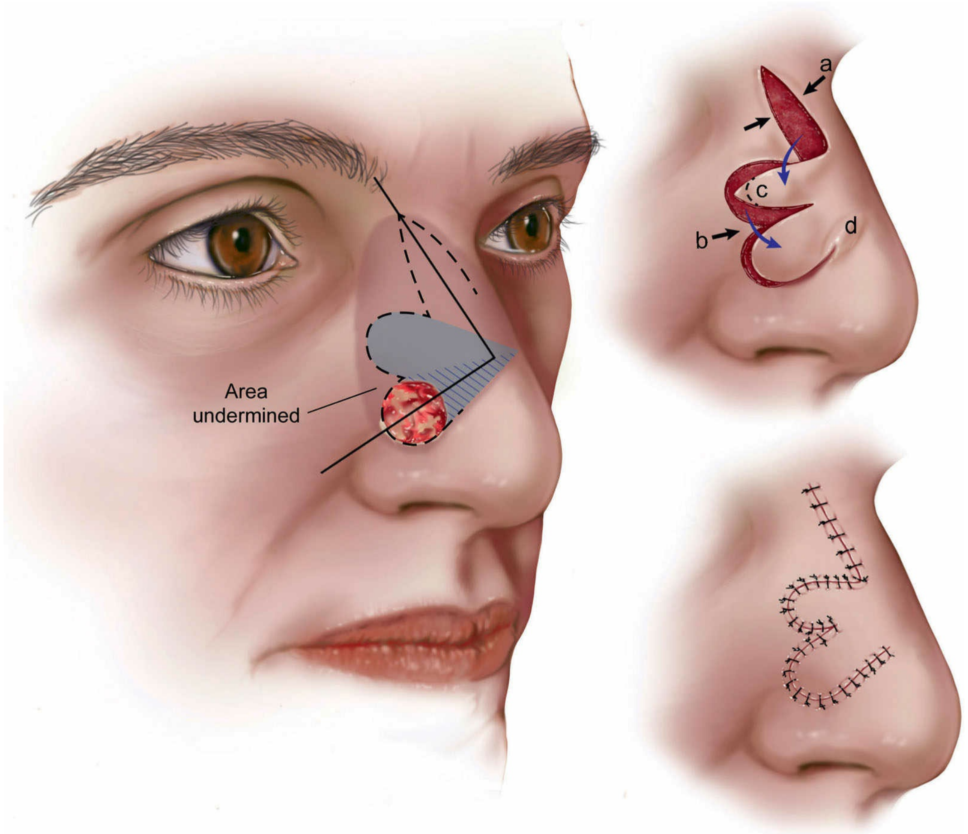


Figure 5.9B. Design of medial-based bilobed transposition flap. The tricone is planned for the junction between two cosmetic units (nasal tip and dorsum or sidewall). Each lobe is the same size as the surgical defect diameter and is located 45 degrees apart. The first part of the flap should be designed as heart-shaped or cordiform (gray shaded area). The second lobe is also approximately 45 degrees from the first lobe (i.e., 90 degrees total) and tapers to a 30-degree angle to facilitate closure. Second lobe design and closure avoid tension on the lower eyelid or medial canthus. After incision of the flap, adequate undermining, and hemostasis, the tertiary defect is closed first ("**a**" in the upper right diagram). Next, the cleft between the two lobes is secured in appropriate position ("**b**" in the same diagram). Finally, the flaps are trimmed as needed and sutured into place ("**c**"), and the tricone is removed and closed ("**d**"). (Hash marks on the image on the left indicate location of tricone excised.)

Figure 5.9C. Medial-based bilobed transposition flap sutured into place.

Figure 5.9D. Healed result.

The second patient in this example is a young man with a surgical defect involving the nasal ala and alar crease **(Fig. 5.9E)**. To keep the repair well situated on one side of the nose and to avoid crossing onto the nasal dorsum, a medial-based pedicle was designed with the tricone directed toward the junction of the nasal sidewall and tip **(Fig. 5.9F)**. As in the first patient, the lobes are the same width as the diameter of the surgical defect and are located 45 degrees from the defect and from one another (total 90 degrees). Closure of the donor site for the second lobe is designed so that there is no tension on the medial canthus or eyelid. After closure of the tertiary defect and placement of the key suture in the cleft between the two

lobes, the first lobe is carefully secured to the wound bed with pexing sutures, and flap edges are secured to the surgical defect edges with absorbable, buried vertical mattress sutures (e.g., 4-0 polyglactin 910). As a result, the wound is reconstructed with most similar color, texture, thickness, and degree of actinic damage; incision lines are well hidden, and distortion of free margins is avoided **(Fig. 5.9G)**.

Key Points

- Medial-based bilobed transposition flaps are useful for defects of up to about 1.5 cm in diameter on the nasal sidewall, ala, and alar crease.
- Placement of the tricone is usually at the junction of the nasal tip or supratip and nasal dorsum or sidewall.
- The same key features for a lateral-based bilobed flap are important here (see discussion in Section 5.4).
- To minimize trapdooring of the flap over a concave surface (e.g., alar crease): secure the flap to surgical defect wound edges with buried vertical mattress sutures; judiciously use pexing sutures in the first lobe; and consider placement of a nasal packing and pressure bandage for the first 24 hours.

Figure 5.9E. Surgical defect on the right nasal ala and alar crease measures 1.2 × 1.0 cm following Mohs micrographic surgery for basal cell carcinoma.

Figure 5.9F. Medial-based bilobed transposition flap sutured into place. Consistent angle of separation and size of lobes prevents distortion of alar rim downward or upward and also avoids impact on nasal valves (see also **Figs. 5.4G and H** regarding how inconsistent angles or lobe size may affect bilobed repair).

Figure 5.9G. Healed view demonstrates good result and maintains free margins and anatomical landmarks in place.

5.10 RIGHT NASAL SIDEWALL AND ALAR CREASE: MELOLABIAL TRANSPOSITION FLAP

The first example is a fairly large defect on the nasal sidewall and alar crease. Considering the size of this defect, there is inadequate tissue on the proximal nose for reconstruction with a local flap; so three options remain: (1) full-thickness skin graft, (2) flap with donor tissue coming from the forehead, and (3) flap with donor tissue coming from the cheek **(Fig. 5.10A)**. A graft is frequently an easy option, but grafts do not reconstruct

depth well, and in addition, because the donor site will likely come from the postauricular or supraclavicular skin, the color, texture, thickness, and degree of actinic damage will be different. Generally, tissue from an adjacent or nearby cosmetic unit provides a superior match for flap or graft repair. That leaves some type of repair from the forehead or cheek for consideration. A paramedian forehead flap could be used, but the author usually prefers to reserve that repair for more complex defects on the nasal tip or ala. A melolabial transposition flap provides an excellent match of skin and soft tissue and is useful for defects on the nasal sidewall, alar crease, ala, and rarely on the lateral tip.

As with any repair, attention to specific details is critical for success **(Fig. 5.10B)**. Firstly, in placement of the more medial incision on the cheek, one must respect the alar sill. The alar sill is the triangular isthmus or peninsula of tissue that separates the cheek, nose, and lip, and one should avoid blunting or obscuring this small anatomical landmark. The medial incision line should follow the inferior border of the nasomelal fold into the melolabial furrow. Secondly, the flap should be long and tapering on the medial cheek and melolabial fold. The entire length of the flap will not be placed within the surgical defect, but closure of the secondary defect and the transition between cheek and lip should be long, subtle, and natural. Thirdly, as this is a transposition flap, the secondary defect should be closed before suturing the flap into the surgical defect. Fourthly, the superior extent of the lateral incision on the cheek (Point "**b**" on **Fig. 5.10B**) only has to extend at or slightly above the superior extent over which transposition is being done (Point "**c**" on **Fig. 5.10B**). Closure of the secondary defect should be perpendicular to the lower eyelid margin and not cause tension on the free margin of the lower eyelid. The width of the flap must be equal to the diameter of the surgical defect (Width "**d**" on **Fig. 5.10B**). Finally, excision of the tricone or standing cone should point to the medial canthus to avoid secondary tension on the lower eyelid (Point "**a**" on **Fig. 5.10B**). Periosteal sutures may be necessary to recreate the concavity between the cheek and nose (nasomelal furrow), and pexing sutures may be helpful at the alar crease (**Figs. 5.10C and D**). At times, a second procedure to recreate the alar crease may be necessary after repair of defects involving the nasal ala.

Figure 5.10A. Surgical defect on the right nasal sidewall and alar crease measures 2.3 × 2.3 cm following Mohs micrographic surgery with immunostains for a lentigo maligna (melanoma in situ on chronically sun-damaged skin). (The size of this defect approaches the upper limit of what is suitable for repair with a melolabial transposition flap in a patient with this amount of laxity on the medial cheek. Younger patients may have adequate cheek laxity for repair of only a smaller defect, whereas older patients with more available cheek laxity may be able to reconstruct a slightly larger surgical defect. The defect and available lax tissue should be evaluated before choosing a repair.)

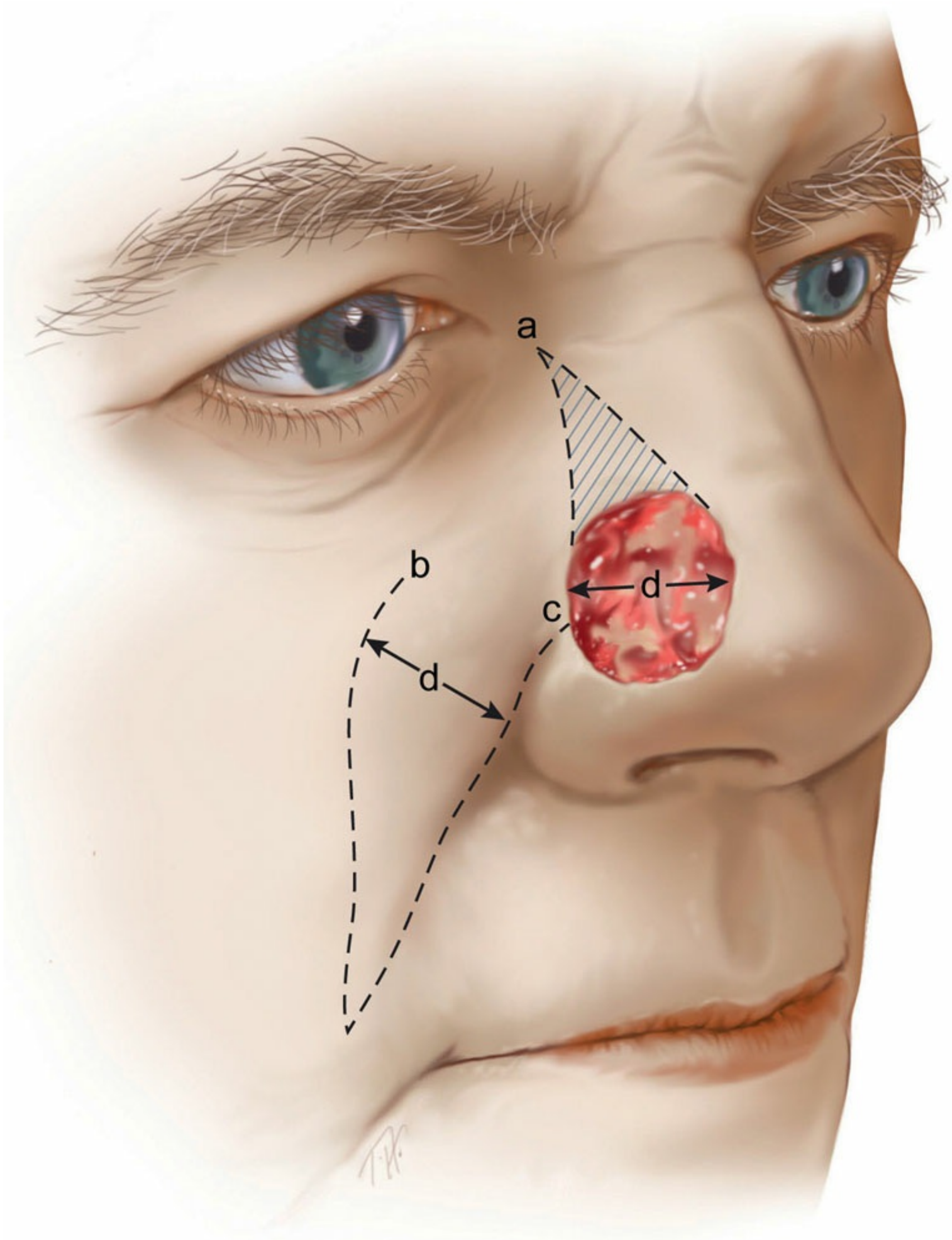


Figure 5.10B. Design of melolabial transposition flap to reconstruct the surgical defect. The incision line "**c**" follows along the melolabial furrow but avoids blunting the triangular alar sill, bordered by the nasal ala, medial cheek, and upper lip. The incision should be long and gradual within the melolabial furrow to avoid an abrupt transition between cheek and upper lip. The second incision line (lateral incision) comes to a point "**b**" just superior to the point over which it must transpose ("**c**"), but closure of the secondary defect (i.e., "**b**" going to "**c**") should not distort the lower eyelid. The width of the flap ("**d**") should equal the width of the defect ("**d**"). After closure of the secondary defect, the flap is transposed into the surgical wound where it is trimmed to fit and sutured into place. Excision of the tricone (hash marks) should point toward the medial canthus ("**a**") to avoid secondary tension vectors on the lower eyelid. Periosteal and pexing sutures may be useful to recreate concavities at the nasomelal cheek and alar crease.

Figure 5.10C. Melolabial transposition flap sutured into place. One or two absorbable sutures may be used to carefully secure the flap to the underlying maxillary periosteum to recreate the concavity at the nasomelal cheek. Similarly, absorbable pexing sutures may be used to carefully secure the flap to the wound bed at the alar crease.

Figure 5.10D. Final healed result. Good match of contour, shape, and color to the missing tissue. A pulsed dye laser could be used to decrease the telangiectasias on the flap, nose, and medial cheek.

The second example is a smaller defect involving the inferior aspect of the nasal sidewall **(Fig. 5.10E)**. The defect is too large to easily reconstruct with a local flap from the proximal nose (e.g., bilobed transposition trap). The medial cheek may be considered a good donor site for a local flap repair of the nasal sidewall. A melolabial transposition flap allows repair with a transposition flap (mitigating secondary tension vectors) with skin

of very similar surface characteristics and placement of incision lines in locations where they will be well concealed (e.g., one within the melolabial furrow and another directed toward the medial canthus) **(Figs. 5.10F–H)**.

Figure 5.10E. Surgical defect on the right nasal sidewall too large for repair with a medial-based bilobed transposition flap (e.g., Section 5.9). Adjacent lax tissue is on the proximal nose and medial cheek.

Figure 5.10F. Melolabial transposition flap sutured into place. The medial incision follows the melolabial furrow while avoiding alteration of the alar sill. The lateral incision on the cheek reaches superiorly at or just superior to the point over which the flap must transpose.

Figure 5.10G. Appearance at 1 week. It is important to note how tricone excised superior to the defect is directed toward the medial canthus, avoiding secondary tension vectors on the canthus or lower eyelid. Also note the long, tapering incision along the melolabial furrow and preservation of the alar sill—the junction between the cheek, nose, and upper lip.

Figure 5.10H. Short-term healed result. Repair demonstrates good color, texture, pore size match, and most incision lines well hidden.

Key Points

- Melolabial transposition flaps may be useful for reconstruction of defects on the nasal sidewall, ala, alar crease, and rarely the lateral tip.
- The flap should be long and should follow along the melolabial furrow, avoiding blunting of the alar sill. The width of the flap needs

to be adequate to fill the width of the surgical defect; so the repair may be less useful for younger patients or patients without adequate cheek laxity.

- The lateral incision needs to only reach a point at or slightly superior to the point of the medial incision (i.e., the point over which the flap transposes).
- As a transposition flap, the secondary defect should be closed first and then the flap secured to the surgical defect.
- The tricone for excision should angle toward the medial canthus to avoid tension on free margins.

5.11 FULL-THICKNESS DEFECT OF THE LATERAL TIP AND SOFT TRIANGLE: REPAIR WITH CHEEK-TO-NOSE INTERPOLATION FLAP (AND NASAL ALAR DEFECT REPAIRED WITH ISLAND VARIANT OF CHEEK-TO-NOSE INTERPOLATION FLAP)

Potential reconstructive options for the first defect would include local flaps from the nose and staged flaps from the forehead and cheek **(Fig. 5.11A)**. As this is a deep, full-thickness defect, a full-thickness skin graft would not adequately reconstruct the depth of the wound, leaving a notched appearance at the soft triangle and alar rim. A local flap on the nose, such as a bilobed transposition flap wrapping around the rim, might work at moving adequate tissue to reconstruct the surface and the depth, including the alar rim, but would create multiple additional incision lines on the side of the nose. These incision lines would result in scars that would not be at the junction of cosmetic subunits and therefore may be more visible. The two most likely aesthetic reconstructive solutions would be staged interpolation flaps, either from the forehead or the cheek. If this were a multisubunit defect or involved a larger portion of the nasal tip, a forehead flap would likely be preferred. Because it is localized to the lateral nasal tip and soft triangle, a cheek-to-nose interpolation flap should work well to reconstruct the defect.

Figure 5.11A. A full-thickness defect measures 2.2 × 1.4 cm and involves a portion of the lateral nasal tip and soft triangle. Although the lower lateral alar cartilage is intact, the alar rim is lost.

Cheek-to-nose interpolation flaps are useful for reconstruction of defects on the nasal ala, lateral nasal tip including the soft triangle, and, in specific, circumstances on the columella. On the nasal ala, this type of repair should be considered for defects involving primarily the nasal ala and sparing the alar crease. The cheek-to-nose flap helps to avoid blunting of the alar crease and nasomelal furrow (as may be a concern with the

melolabial transposition flap). At the same time, if the defect involves both the ala and alar crease, a melolabial transposition flap may be more useful to repair that multisubunit surgical defect. Irrespective of which of these repairs is considered, the color, texture, thickness, and sebaceous quality of the medial cheek skin matches well with the skin of the distal nose. Finally, the cheek-to-nose interpolation flap has a tendency to trapdoor, which may be beneficial in reconstruction of the convex nasal ala.

Design of the cheek-to-nose interpolation flap is similar in some aspects to a melolabial transposition flap **(Fig. 5.11B)**. The medial incision follows the melolabial furrow and avoids the small isthmus of skin between the nasal ala, cheek, and upper lip. The distal point of this incision is carried for a distance along the melolabial furrow, ensuring that the flap adequately reaches the defect without significant tension. In addition, there is no reason for a short flap, and a longer tapering flap allows a more natural transition between the cheek and upper lip. The lateral incision of the flap is carried to a point just a few millimeters superior to the point over which the tissue is being transposed (i.e., just slightly more superior than the high point of the alar sill). No tricone is excised, as the pedicle will be removed at 3 to 4 weeks when the pedicle is divided and inset. The width of the flap must be wide enough to completely repair the defect. In the first case, the flap must be wide enough to reconstruct the ala, alar rim, and wrap around and reconstruct the portion of the missing nasal vestibule mucosa. Because the lower alar cartilage is intact, there is no need for an alar batten graft for structural support. For defects on the lateral tip or soft triangle like this one, the skin attachment of the pedicle can be kept intact (**Figs. 5.11B–D**). For defects on the nasal ala, the skin can be incised and a well-vascularized subcutaneous pedicle maintained (**Figs. 5.11H–N**). After the flap is incised, it is mobilized by careful blunt and sharp dissection. The blood supply to the flap is random, based on branches of the facial and angular arteries, and therefore must be properly designed with a generous pedicle. As the base of the pedicle is approached, dissection is primarily blunt to minimize transection of blood vessels, and the pedicle base is kept thick, allowing incorporation of additional branches that perforate through the levator labii muscle. After adequate hemostasis, the secondary defect is closed allowing the flap to transpose to the surgical defect **(Fig. 5.11C)**. The flap should reach the secondary defect easily; otherwise, additional blunt dissection may facilitate mobilization of the flap. The distal aspect of the flap may be carefully thinned so that it reconstructs the appropriate depth of the defect, but remember that unlike the paramedian forehead

flap, this is a random flap and therefore should not be thinned aggressively. The flap is sutured into place, and petrolatum/bismuth-impregnated gauze is carefully sutured to the open portion of the pedicle **(Fig. 5.11D)**.

Figure 5.11B. Design of a cheek-to-nose interpolation flap. In this case, the cutaneous connection is maintained; for defects involving just the nasal ala, the flap can be raised as an ellipse-shaped flap without cutaneous connection (similar to an island flap, **Figs. 5.11H–N**). The incision of this flap is similar in appearance to a melolabial transposition flap with a long, tapering incision following the melolabial fold and avoid blunting of the isthmus of skin between the cheek, lip, and nose.

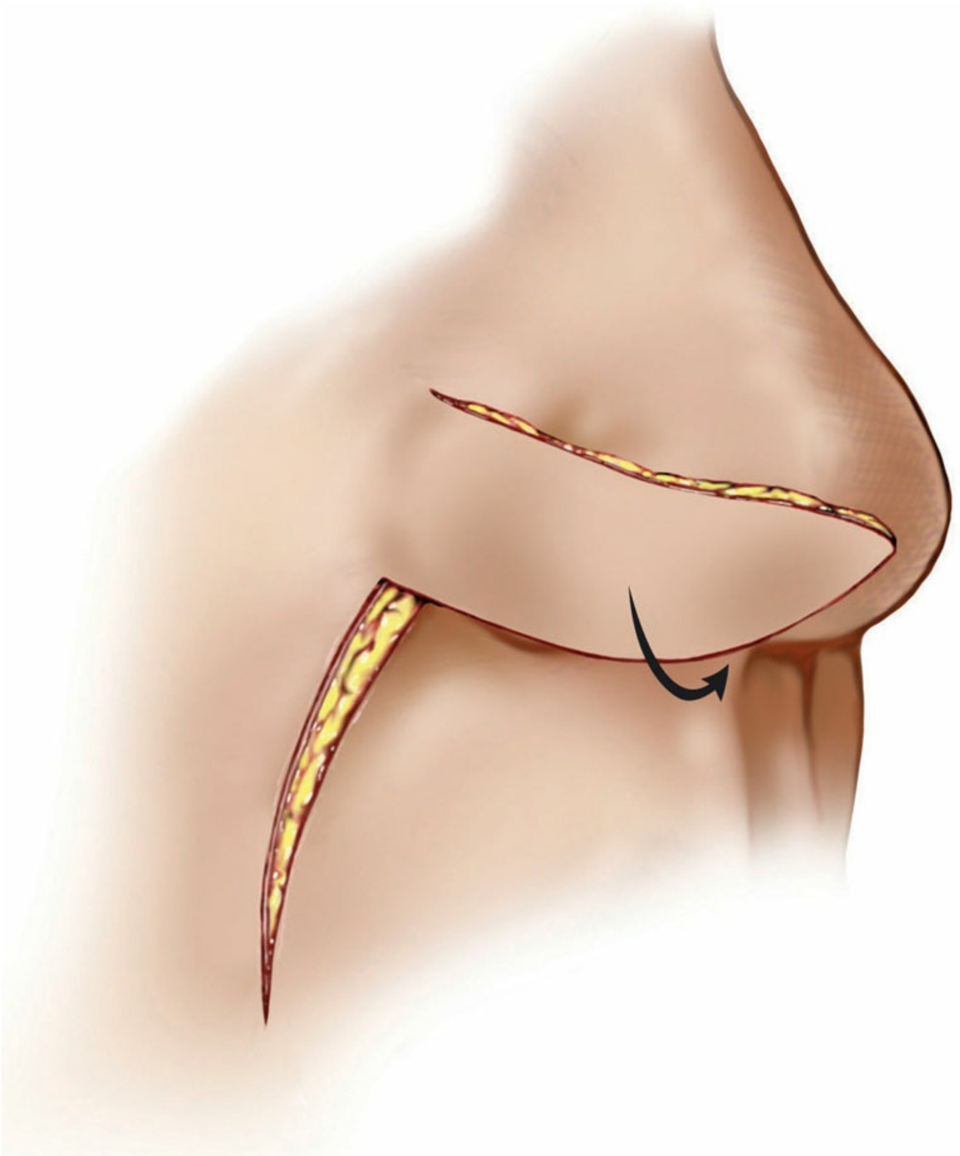


Figure 5.11C. After the secondary defect is closed, the flap is transposed and wrapped around to reconstruct the surgical defect, recreating the alar rim. There should be little or no tension on the flap.

Figure 5.11D. Appearance of cheek-to-nose interpolation flap sutured into place. A small piece of petrolatum/bismuth-impregnated gauze is secured to the open portion of the pedicle for hemostasis and to minimize desiccation.

Cutaneous sutures are removed at 7 days, and division and inset of the pedicle occurs at 3 to 4 weeks **(Figs. 5.11E and F)**. At the time of division and inset, the flap may be thinned or trimmed carefully. This flap provides a good color, texture, and thickness match for full-thickness defects of the soft triangle of the nasal tip **(Fig. 5.11G)**.

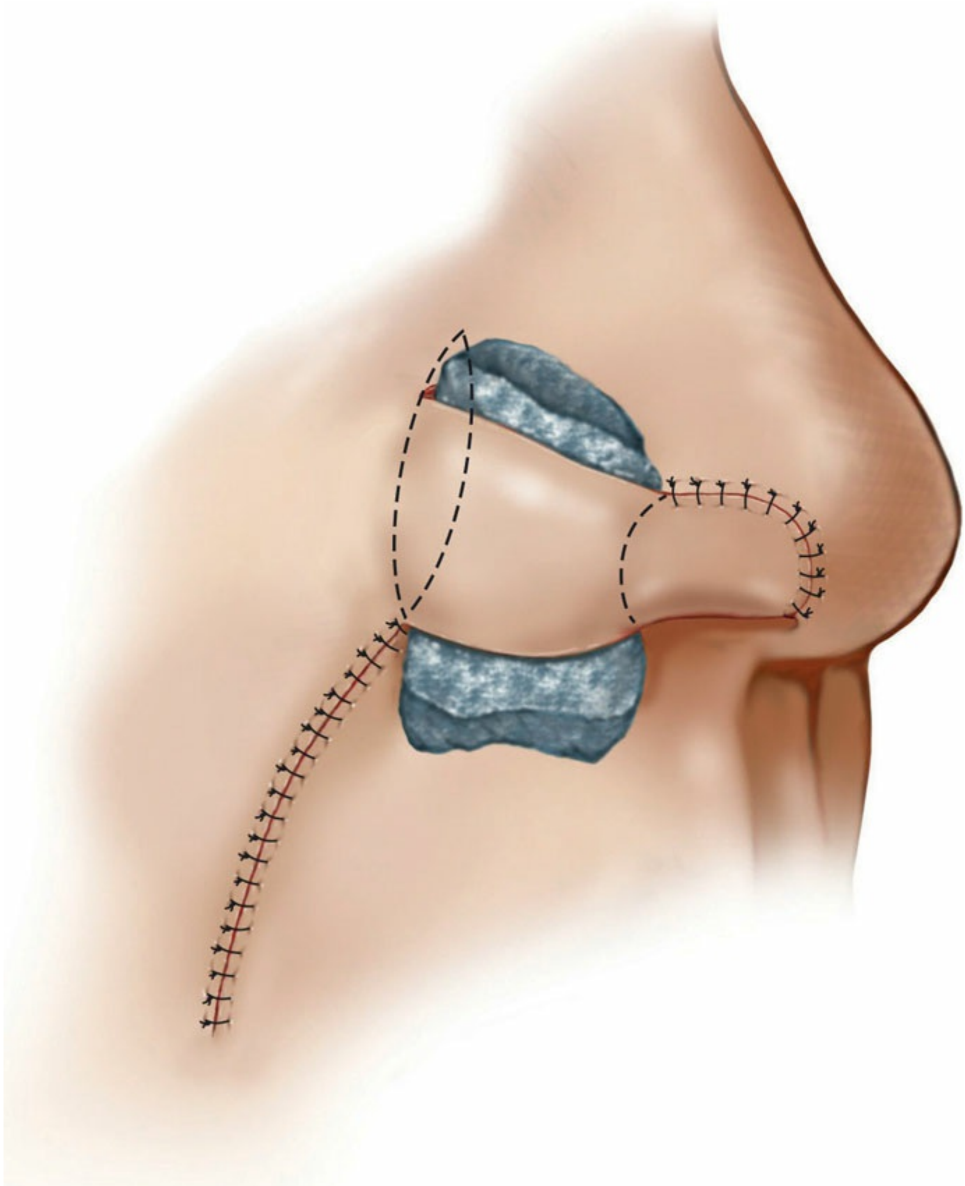


Figure 5.11E. Design of division and inset of pedicle approximately 3 to 4 weeks later. An elliptical incision is made around the base of the pedicle and closed. The flap is further trimmed and sutured into place.

Figure 5.11F. Appearance immediately after division and inset of the pedicle.

Figure 5.11G. Final healed result.

For a surgical defect principally involving the majority on the nasal ala, the skin of the interpolation flap can be incised circumferentially while preserving a well-vascularized subcutaneous pedicle. This island variant may offer easier rotation of the pedicle base **(Figs. 5.11H and I)**.

Figure 5.11H. Surgical defect involves most of the left nasal ala.

Figure 5.11I. Swimmer's view demonstrates loss of support of the ala and the external nasal valve.

As the cheek-to-nose interpolation flap is a random flap and the flap frequently rotates 90 degrees or more, creation of a more mobile flap decreases the risk of flap necrosis **(Fig. 5.11J)**. As with other melolabial or cheek-to-nose flaps, a long tapering flap with one incision falling within the melolabial furrow helps to hide the scar and decrease noticeable asymmetry. The long axis of the flap will transpose and become the anterior-posterior dimension of the defect; so careful measurement and template use ensure proper flap dimensions.

After the ellipse-shaped flap is incised, blunt and sharp dissection continues toward the subcutaneous pedicle on the medial cheek, where careful blunt dissection preserves a well-vascularized pedicle base. The flap is transposed to the surgical defect, ensuring adequate reach and minimal tension. If necessary, additional careful blunt dissection can further mobilize the flap. The flap covering the surgical defect is thinned (not as much as an axial flap such as the paramedian forehead flap), leaving a very thin layer of subcutaneous fat. The surgical defect can be enlarged (template and flap design should have taken this into account) so that repairs can be completed within cosmetic subunits. One important exception to this is the attachment of the ala to the alar sill. Whenever possible, a small stump of native posterior ala (e.g., 2 to 3 mm) should be

preserved for attachment of the flap as it is quite difficult to properly reproduce the attachment of the ala to the alar sill, and the incision of the flap on the posterior ala will still be well hidden.

If necessary, a cartilaginous batten graft can be used along the alar rim to add structural support and preserve external nasal valve function. In most cases, this cartilage is harvested from the posterior wall of the conchal bowl, the dimension of the strut being approximately 5 to 8 mm in width and approximately 6 to 8 mm longer than the defect needed to span. Conchal cartilage is used because it is firm, has a nice concave surface (useful in creating the convex surface of the ala), and is easy to harvest. Small, 3 to 4 mm deep pockets are made into the remaining alar tissue for the alar batten graft to slip into place, and the graft is secured to the wound bed with 4-0 polyglactin 910 sutures lassoed around the cartilaginous graft and securing it to the wound bed.

Figure 5.11J. A cheek-to-nose interpolation flap is utilized to reconstruct the alar defect. In this case, because the defect involves only ala and not soft triangle or nasal tip, an elliptical island flap with a well-vascularized pedicle is created. A cartilage batten graft from the conchal bowl is used to provide structure and support to the alar rim. (Immediate postoperative view. A fine mesh gauze impregnated with 3% bismuth tribromophenate and petrolatum is carefully wrapped around the open pedicle to avoid desiccation.)

Figure 5.11K. Appearance immediately before division and insert of pedicle at 3 weeks. Donor site appears well healed in the melolabial fold. Paper tape remains on nasal ala, and the petrolatum gauze has dried out.

Figure 5.11L. Immediate postoperative appearance. Flap carefully thinned and trimmed to fit surgical defect.

Once the secondary defect on the cheek is closed, the flap is sutured into place with nonabsorbable suture, and a petrolatum/bismuth gauze is carefully secured to the exposed portion of the pedicle **(Fig. 5.11J)**. Sutures are removed at 1 week, and like other interpolation flaps, the flap is divided and inset at 3 to 4 weeks **(Figs. 5.11K–N)**.


Figure 5.11M. Healed view. Good color, texture match, and good contour.

Figure 5.11N. Swimmer's view demonstrates good patency and support to nasal ala and alar rim.

Key Points

- The cheek-to-nose interpolation flap is a random pattern flap useful for repair of defects on the nasal ala, lateral nasal tip, and columella. For repair of defects on the lateral nasal tip or columella, the skin of the pedicle may be kept intact. For defects limited to the nasal ala, the skin of the pedicle can be incised, permitting easier rotation of the flap.
- A well-vascularized pedicle should be maintained, and the flap should be sutured into place with minimal tension.
- For alar defects, the surgical defect may be enlarged to place incisions at the junction of the ala's cosmetic subunit, but preservation of a portion of the posterior nasal ala (when possible) may allow a more aesthetic result.
- Cartilaginous batten grafts may provide structural support for the alar rim.
- Batten grafts should be secured to the wound bed by placing the ends of the graft within pockets on both sides of the alar defect and utilizing absorbable sutures to secure the cartilage graft to the

underlying wound bed.

5.12 LARGER DEFECTS ON THE NASAL TIP OR DISTAL NOSE: PARAMEDIAN FOREHEAD FLAP

The first patient is younger and presents with a large defect on the right nasal tip, anterior alar crease, and extends onto the nasal sidewall **(Fig. 5.12A)**. The key here is to transfer enough bulk to fill the void of soft tissue and resurface with skin that matches the missing nasal skin. A paramedian forehead flap fulfills these requirements **(Figs. 5.12B–D)**. By slightly enlarging portions of the surgical defect such that incisions are placed more closely at the junctions of cosmetic subunits, the incision lines and subsequent scars are hidden better **(Figs. 5.12E and F)**.

Figure 5.12A. Surgical defect in young patient involves the lateral nasal tip, anterior alar crease, and nasal sidewall.

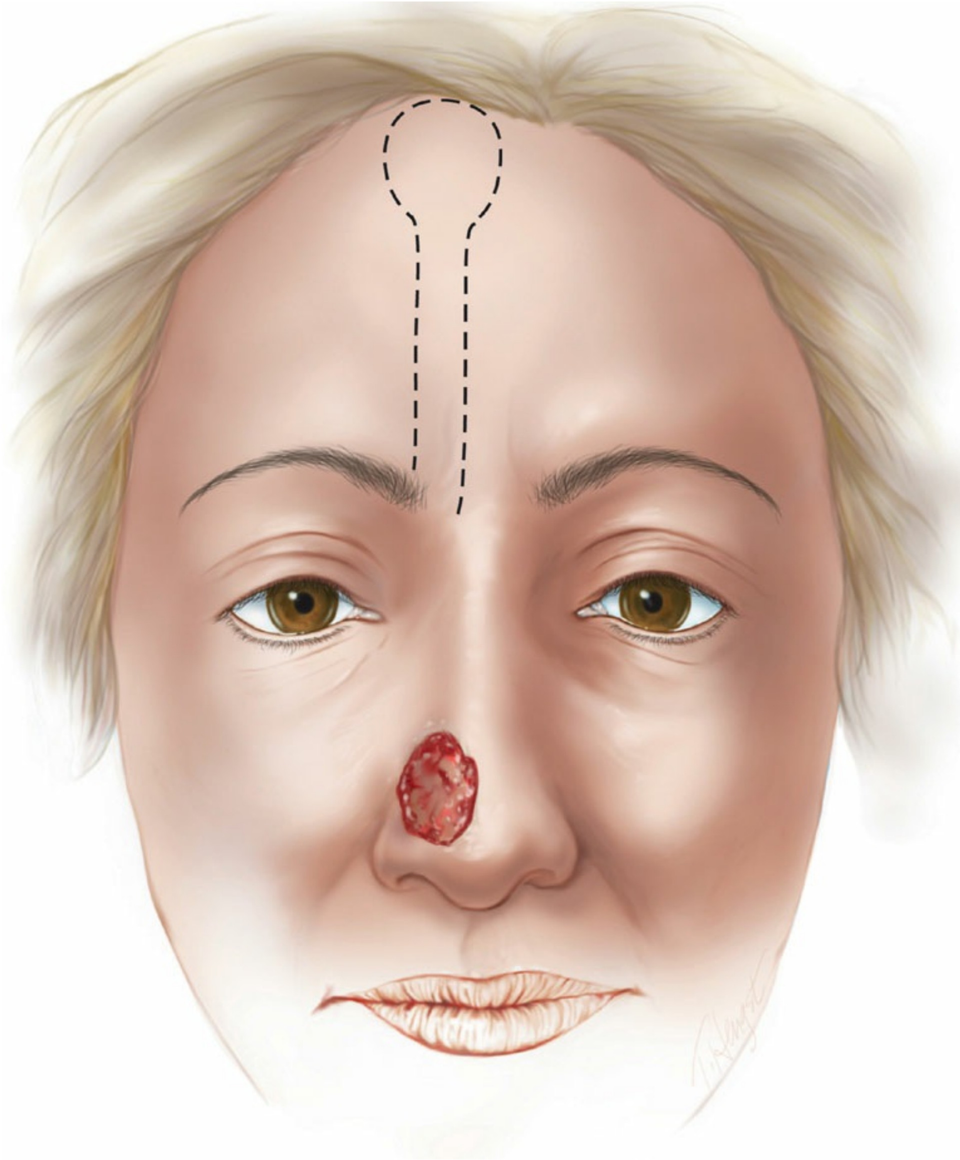


Figure 5.12B. Diagram of ipsilateral paramedian forehead flap. The pedicle width should remain between 1.2 and 1.5 cm until it reaches the template that is adjacent to the frontal hairline. The base of the pedicle is centered over or just medial to the glabellar furrow, where the supratrochlear artery crosses the orbital rim sandwiched between the corrugator and frontalis muscles. If necessary for reach, the medial incision can be carried out beyond the orbital rim, provided care is taken to avoid trauma to the blood vessels.

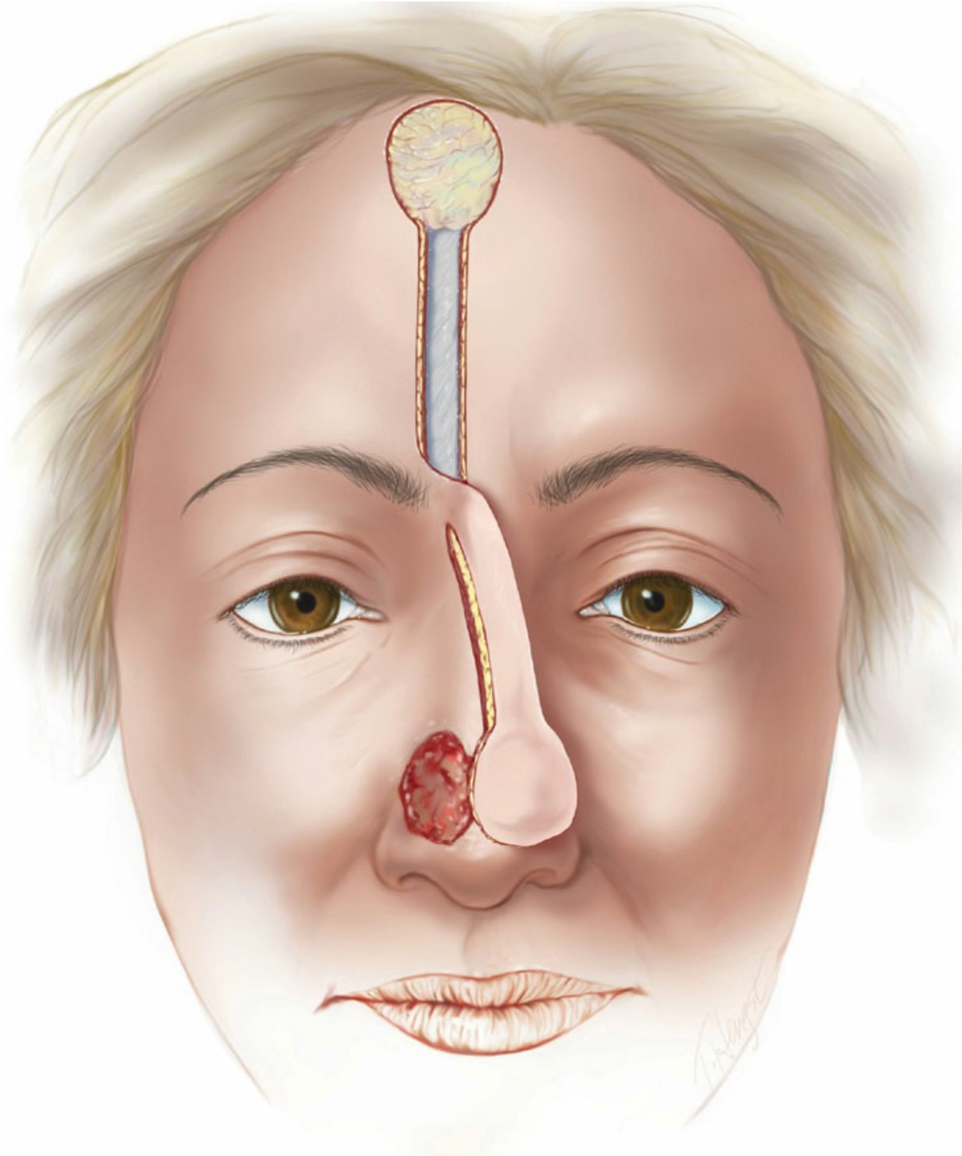


Figure 5.12C. The defect beneath the template may be kept very superficial (except in smokers), allowing for quicker and improved healing by second intention healing. The incision for the pedicle is at the level of the periosteum and continues at this depth proximally. The defect from incision of the pedicle is easily closed in a side-to-side fashion before the flap is transposed to the surgical defect on the nose.

Figure 5.12D. Surgical wound enlarged slightly, so there are more incisions at junctions of cosmetic subunits. Paramedian forehead flap sutured into place. Bismuth/petrolatum-impregnated gauze is wrapped around open portion of the pedicle and is carefully secured at the superficial edges of the pedicle.

Figure 5.12E. Oblique view, healed appearance following scarabrasion 3 months after surgery.

Figure 5.12F. Full-face healed appearance.

The second patient is older, and the defect involves the entire nasal tip cosmetic subunit, extending to the underlying alar cartilage and the columella and soft triangles **(Figs. 5.12G and H)**. Reconstructive options are limited for a defect this large on the nasal tip. A paramedian forehead flap will provide adequate skin and soft tissue for repair **(Figs. 5.12I–L)**.

Figure 5.12G. Surgical defect involves nasal tip and extends into columella.

Figure 5.12H. Lateral view demonstrates that defect extends to underlying cartilage and there is loss of nasal tip projection.

Figure 5.12I. Paramedian forehead flap sutured into place. Superior aspect of donor site partially closed; remainder allowed to heal by second intention healing.

Figure 5.12J. Immediately after division and inset of pedicle at 3 to 4 weeks following first surgery. Donor site adjacent to hairline is almost completely healed at this point.

Figure 5.12K. Full-face healed view at 3 months demonstrates both donor site and nasal tip healing well.

Figure 5.12L. Lateral healed view demonstrates good projection of nasal tip and well-healed surgical scars.

In contrast to the cheek-to-nose interpolation flap, the paramedian forehead flap is an axial pattern flap, based on the supratrochlear artery and contributions from other nearby vessels. The artery crosses the orbital rim at the glabellar crease sandwiched between the frontalis and corrugator muscles until the midforehead, where it passes superficially through the frontalis muscle and travels to the superior forehead in the superficial subcutaneous tissue. Like other axial pattern flaps, knowledge of the anatomy is crucial in design and successful reconstruction.

Like other more complex repairs, the best option for success is a systematic approach to the design and implementation of the flap. As was done with other reconstructive procedures such as the bilobed transposition flap in Section 5.4, if we approach the paramedian forehead flap in a deliberate systematic manner, the repair seems less intimidating, and ease and success are more certain.

STEP-BY-STEP PARAMEDIAN FOREHEAD FLAP

5.12.1 Step-By-Step: Paramedian Forehead Flap

1. **Choose which side to base the flap.** Generally, an ipsilateral pedicle is designed in relation to the surgical defect (see **Fig. 5.12B**). Although a contralateral pedicle twists less, the distance between the base of an ipsilateral flap and the distal aspect of the surgical defect is less and therefore more easily reachable. The difference in angle of rotation is less important in a properly designed flap.
2. **Create a template of the defect.** The surgical defect is extended to the edges of the cosmetic subunit so that incision lines and subsequent scars are well hidden. A Telfa or other nonadherent dressing is carefully placed over the defect and pressure applied so that a template of the defect is created. The template is trimmed, and appropriate size and shape is rechecked. This template will be placed on the superior ipsilateral forehead adjacent to the hairline and represents the distal aspect of the paramedian forehead flap.
3. **Design the pedicle of the flap.** The narrowest part of the pedicle over the glabellar crease measures between 1.2 and 1.5 cm in width. Usually, the supratrochlear artery can be found just medial to the glabellar crease; so the pedicle should be designed with this in mind. This pedicle is maintained at the same width until it reaches the template, where the flap is carefully marked out around the template. A 4 × 4 gauze may be used as a model of the pedicle and flap to ensure that the flap can reach the surgical defect from the base of the pedicle.
4. **Incise the flap.** The flap is incised to the superficial subcutaneous tissue around the template. When the incision is carried from the distal flap onto the narrower pedicle (i.e., midsuperior forehead), the incision dives down below the frontalis just above the periosteum. From this point downward, the incision and blunt dissection are maintained at

this level along the periosteum. By keeping a wide-enough pedicle in the proper location and at the proper plane, the supratrochlear and other vessels are safely protected within the pedicle. If additional flap length is necessary, careful undermining and incision of the medial incision of the pedicle can extend below the orbital rim to a short distance.

5. **Thinning of the distal flap.** Except in smokers, the distal part of the flap can be aggressively thinned, and the reach and coverage of the flap checked. The edges of the flap should have excessive fat judiciously removed so that wound edges are even when sutured. Light spot electrodesiccation can be performed at this time.
6. **Suture the flap into place.** Like other transposition flaps, the secondary defect (i.e., forehead) is closed first **(Fig. 5.12C)**. The most superior aspect of the forehead wound (i.e., site of the template) may be allowed to heal by second intention healing if necessary. After closure of the secondary defect on the mid and inferior forehead, the flap is sutured into the surgical defect on the nose. There should be minimal or no tension on the flap. The exposed open pedicle is covered and sutured carefully with a petrolatum/bismuth-impregnated gauze, avoiding ligation of accessory blood vessels in the pedicle **(Figs. 5.12D and I)**. A pressure bandage can be applied for 24 hours; however, pressure should be avoided on the pedicle of the flap.
7. **Suture removal and division and inset.** Percutaneous sutures are removed at 1 week and steristrips applied. The patient continues local wound care to the second intention healing wound on the superior forehead until completely healed. The pedicle of the flap is divided and inset 3 to 4 weeks after the first surgery **(Fig. 5.12J)**. At the same time, the flap can be thinned or wound edges "cleaned up" or revised as necessary. Final healed pictures demonstrate that the flap provides a good source for repair of larger defects on the distal aspect of the nose, and the donor site heals well by second intention healing **(Figs. 5.12E, F** and **K, L)**.

Key Points

- The paramedian forehead flap is an axial pattern flap based on the supratrochlear artery and other nearby vessels.
- The supratrochlear artery crosses the orbital rim deep to the glabellar furrow (i.e., just medial to the medial aspect of the brow),

sandwiched between the corrugator and frontalis muscles. The pedicle of the flap should be between 1.2 and 1.5 cm in width at this location.

- Defects on the *central or mid*nasal tip/supratip/columella can be repaired with a flap coming from either side of the forehead. Defects on one side of the nose should be considered for repair with an ipsilateral flap.
- Incision of the most superior aspect of the flap is to the superficial subcutaneous fat only. Once the incision reaches the narrower pedicle, it should dive to the periosteum and stay at that level proximally in order to preserve the blood supply.
- The pedicle can be lengthened a small amount by careful extension of the medial incision just beyond the orbital rim, taking care to avoid trauma to the supratrochlear artery and other nearby blood vessels.

6 Lip Reconstruction

Critical in speech, sustenance, and conveyance of emotions, functional integrity of the lips requires preservation of oral aperture and competence as well as sensation and mobility. At the same time, the aesthetic importance of the lips is obvious by their central location, subtle variations in surface contour, color, and texture, and importance as a focus of facial beauty in society. Because of an absence of underlying cartilaginous or

bony support, they are particularly sensitive to distortion of free margins and trapdooring (pincushioning) of flaps. In short, functional integrity and aesthetic appearance should be maintained, and unsightly scars, asymmetry, or distortion should be avoided.

6.1 LEFT UPPER CUTANEOUS LIP: SIDE-TO-SIDE REPAIR

A side-to-side or complex linear closure is an excellent alternative for small defects on the upper or lower lip (**Figs. 6.1A–D**). Three key points should be stressed: (1) the wound should be closed in a direction perpendicular to the margin of the lip; (2) tricones or standing cones should be excised irrespective of whether or not excision will cross the vermilion border; and (3) the vermilion border, if crossed, should be accurately reapproximated. The first point avoids deviation of the free margin of the lip and places incision lines in actual or expected perioral rhytides. The second point prevents displacement of the vermilion border (**Fig. 6.1E**). And finally, if and when the vermilion is crossed, proper realignment should be ensured. The best approach is to mark out the border preoperatively with a surgical marker or to score the vermilion border. A poorly approximated vermilion border will likely require surgical revision subsequently.

Key Points

- Wounds closed in a side-to-side fashion should follow the direction of perioral rhytides and approach the vermilion border at right angle to the border.
- Do not hesitate to cross the vermilion border when excising standing cones. Too short of an excision will deviate the lip margin.
- If you cross the vermilion border, carefully reapproximate it. (Start buried sutures at the vermilion border or just above it in order to ensure accurate reapproximation.)


Figure 6.1A. Small surgical defect on right upper lip.

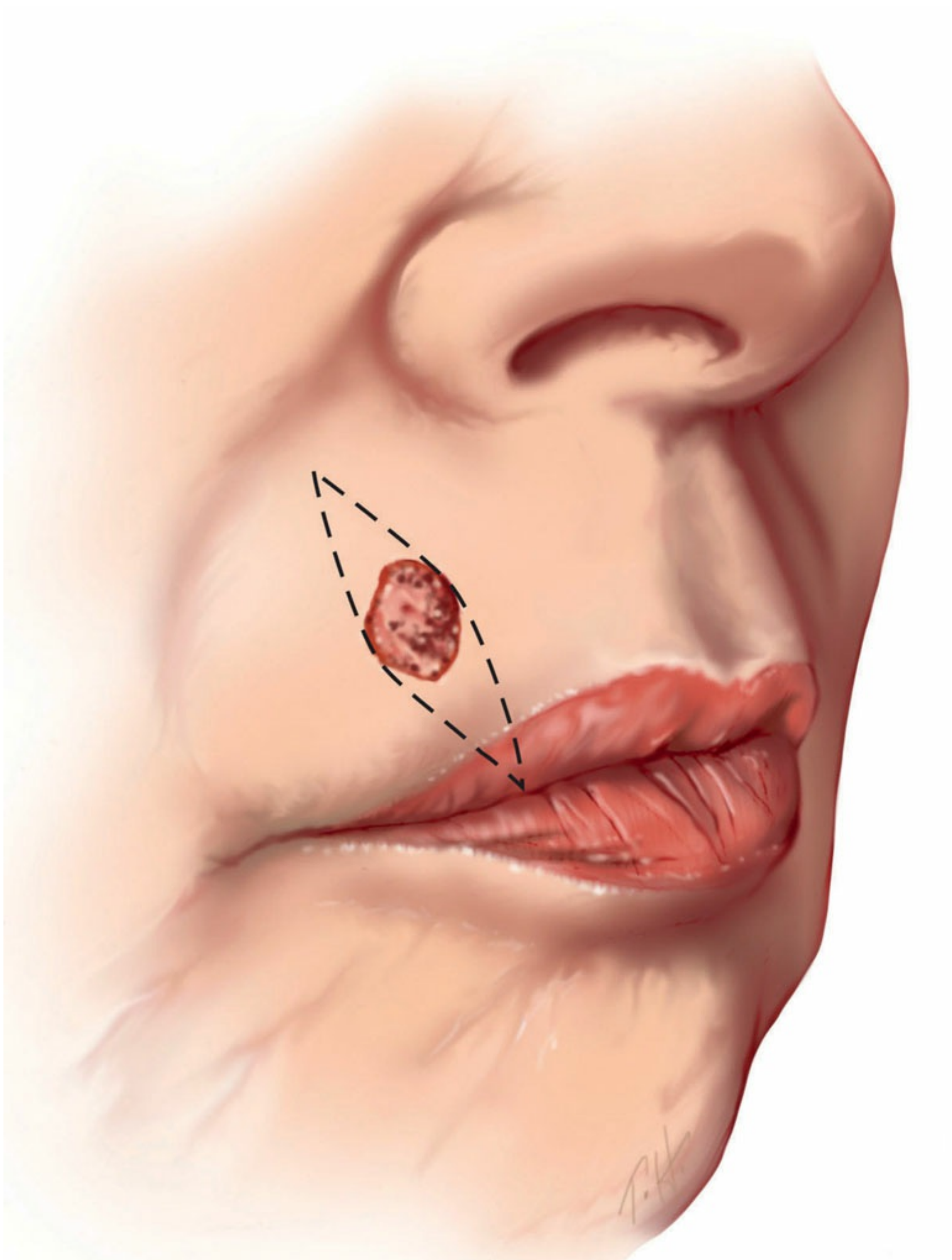


Figure 6.1B. Design of complex linear repair. Closed along relaxed skin tension lines in the direction of perioral rhytides. Appropriate-sized tricones must be removed and vermilion reapproximated.

Figure 6.1C. Appearance immediately after repair.

Figure 6.1D. Healed view. Incision line well hidden in perioral rhytide.

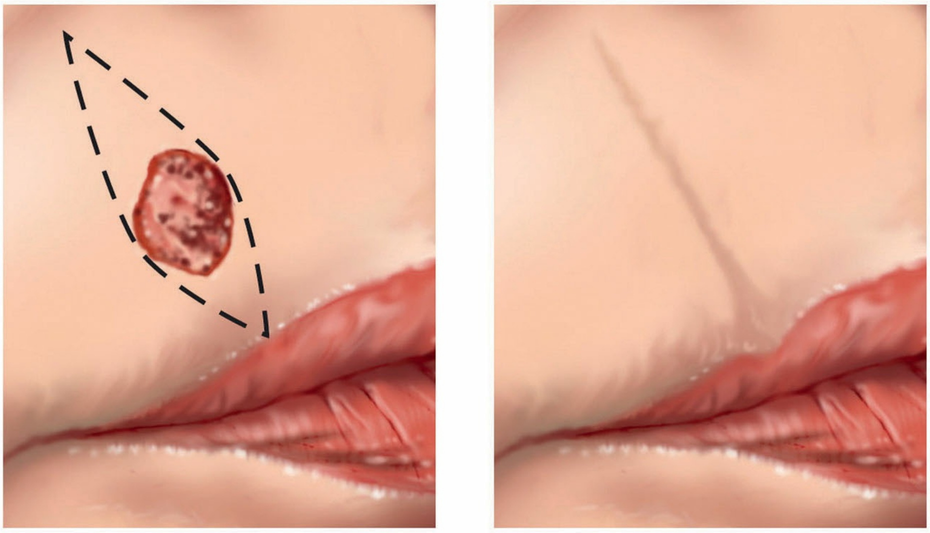


Figure 6.1E. Incorrect design of repair. By hesitating to cross the vermilion border and shortening the tricone excised, the residual standing cone distorts the free margin of the lip downward.

6.2 RIGHT UPPER LIP: ADVANCEMENT FLAP

This defect is too large for a side-to-side repair unless the surgical defect was made full-thickness and the defect closed as a wedge excision (**Fig. 6.2A**). As the only tissue missing is the skin and subcutaneous fat, it is preferable to focus on reconstruction of those structures and leave intact the remaining healthy underlying tissues. Consider what is missing: skin and subcutaneous tissue, and consider where there is adequate tissue from which to borrow. In this case, the loose tissue is located laterally in the lateral lip and medial cheek.

Figure 6.2A. Broad defect on the upper lip measures approximately 1.5 × 1.1 cm and is located just superior to the vermilion border.

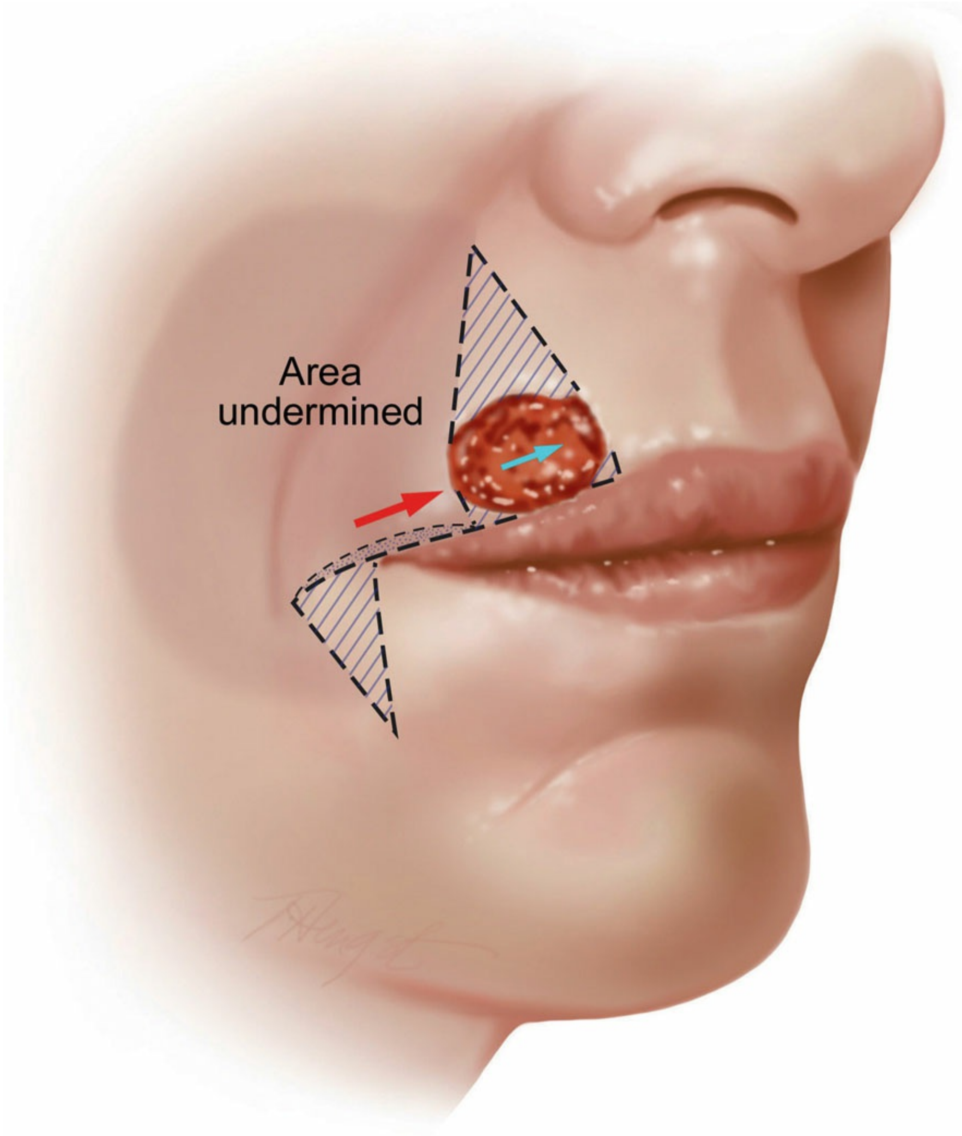


Figure 6.2B. Design of the advancement flap, which recruits tissue from the lateral upper lip and medial cheek. The repair is completed within cosmetic subunits, enlarging the defect if necessary so that the incision is kept at the vermilion border. The incision follows the vermilion border past the oral commissure toward the medial cheek. A tricone is excised at the oral commissure, with the incision line falling within the marionette line. Excision of this tricone and undermining onto the cheek facilitates advancement of the flap. The direction should be slightly angled upward (i.e., same as upward direction of vermilion border). (Areas marked out with diagonal lines or hash marks indicate tissue to be removed.) A small crescent of tissue may be excised above the vermilion border incision to minimize downward deviation of the lip margin (see dashed lines and dotted or stippled area), but excessive excision that could cause eclabium should be avoided.

An advancement flap from the lateral lip and medial cheek is a good option for repair of this defect (**Fig. 6.2B**). Most of the incision lines will be well hidden, and the tissue is an excellent match for repair. To get

started, if the defect does not extend to the vermilion border, it should be enlarged so that the repair and subsequent scar is located at the junction of the cosmetic subunits. The flap incision starts at the lateral-inferior aspect of the defect and continues laterally, following just above the vermilion border within what is referred to as the “white roll.” The incision continues past the oral commissure to the medial cheek, where a tricone is excised to allow advancement of the flap. The flap is undermined widely by blunt and sharp dissection in the superficial subcutaneous fat, extending onto the medial cheek from where the loose tissue is recruited. After adequate mobilization, the flap is advanced along the vermilion border and secured with absorbable buried vertical mattress sutures to the medial aspect of the surgical defect, being careful to avoid upward pull of the lip (eclabium) (**Figs. 6.2B–D**). Even with careful attention to the direction of flap movement, the flap may have a tendency to push downward the lateral aspect of the lip (“hooding”). This may be related to the progressive widening of the flap or to excessive soft tissue in the portion of the flap that extends lateral to the oral commissure onto the medial cheek. To avoid this downward pressure on the lateral upper lip, the flap should advance in the slight-upward direction of the vermilion border (slight-downward on the lower lip), avoiding upward or downward forces on the lip margin. If necessary, a very small crescentic portion of tissue may be removed along the flap border, but overly aggressive surgical resection and resultant eclabium should be avoided (**Fig. 6.2B**). It is easy to remove additional tissue in a secondary procedure, but much more difficult to add tissue when too much was removed in the first procedure.

Figure 6.2C. The advancement flap sutured into place. The flap is advanced along the vermilion border, taking care to avoid downward or upward deviation of the vermilion border.

Figure 6.2D. Final healed result.

The second patient is older and the defect larger, but the principles remain the same (**Fig. 6.2E**). The adjacent loose tissue is located on the lateral upper lip and medial cheek. The advancement flap recruits tissue from these resources, and incisions are placed in locations where they will be best hidden within relaxed skin tension lines (perioral rhytide and marionette line) and a cosmetic subunit border (vermilion border) (**Figs. 6.2F and G)**.

Figure 6.2E. Surgical defect on the right upper lip measures 2.9 × 2.2 cm and extends to the vermilion border.

Figure 6.2F. Advancement flap reconstructs the upper lip, recruiting loose tissue from the lateral upper lip and medial cheek. The incision follows the vermilion border past the oral commissure, and a tricone is excised and closed within the marionette line.

Figure 6.2G. Healed result at 5 months. Most incision lines are well healed along the vermilion border, marionette line, and perioral rhytide.

Key Points

- Incisions are placed just above the vermilion border within the white roll continuing past the oral commissure where a tricone is excised. Closure of this tricone falls within the marionette line.
- Undermining is continued in the superficial subcutaneous plane onto the medial cheek from where the majority of loose tissue is recruited from.
- The flap is advanced along the vermilion border, avoiding upward or downward deviation of the free margin.
- Tricones excised upon advancement of the flap follow the direction of perioral rhytides.

6.3 UPPER LIP: ROTATION FLAP

For many surgeons a defect such as this one on the upper lip near the alar sill is frequently repaired with a rotation flap (**Fig. 6.3A**). Although rotation flaps may work for this type of wound, they are not the author's "go-to" repair for this region, especially for defects within the alar sill.

Although much of the arciform incision is hidden within the melolabial fold, movement of the flap can cause some distortion or lifting of the oral commissure (as seen in **Fig. 6.3B**). At the same time, for a defect just outside the alar sill and perhaps too big for side-to-side repair, it may be the best option available. Transposition flaps tend to create too many additional incisions and scars, have a tendency to trapdoor, and may distort the lip if not designed properly. Crescentic advancement flaps may create asymmetry and blunting of the alar sill. In the author's opinion, island advancement flaps are a better option for defects located within the alar sill (see Section 6.4); but for this defect sitting just outside the alar sill, the rotation flap worked fairly well. Much of the incision is hidden, and except for slight lifting of the oral commissure, the cosmetic result is quite acceptable (**Fig. 6.3C**).

Key Points

- For small defects too large for side-to-side repair located just outside of the alar sill, a rotation flap may provide an aesthetic result, but too large of a rotation flap may cause lifting of the oral commissure.
- The arciform incision should follow the melolabial furrow past the oral commissure, where a tricone may be excised or back cut created.

Figure 6.3A. Surgical defect on the left upper lip near the alar sill.

Figure 6.3B. Repair with rotation flap. Much of the incision is well hidden within the melolabial fold, but there is some mild lifting of the left oral commissure.

Figure 6.3C. Final healed result. Well healed and much of the lifting of the oral commissure observed following surgery has resolved.

6.4 ALAR SILL: ISLAND ADVANCEMENT FLAP

Unlike the example in Section 6.3, this defect falls within the alar sill, occupying the triangular peninsula of tissue bordered by the cheek, nose, and upper lip (**Fig. 6.4A**). Although some might consider rotation flap repair as seen in the earlier case, the same problems exist, namely lifting of the oral commissure or distortion of the lip. Another alternative that works well in this region is an island advancement flap. As these flaps lack a

cutaneous attachment, they are more mobile than other random pattern flaps. The blood supply for this flap is entirely within the subcutaneous pedicle; so proper design of the flap and handling of the tissue is of key importance. There are a number of reasons that the island advancement flap works well here. The repair is kept within one cosmetic unit. One long side of the triangular flap and the base are placed at the junction of the cosmetic units; so the subsequent scars are fairly well hidden. The flap is very mobile, and secondary tension vectors do not lift the oral commissure or free margin of the lip as was seen with the rotation flap.

Figure 6.4A. Surgical defect on the alar sill measuring 2.3 × 1.5 cm.

Successful design and execution of the island advancement flap in this location is dependent on a couple of key details. One long incision line follows the melolabial furrow while the second one crosses the lip, gradually tapering to a point where it meets the melolabial furrow incision (**Fig. 6.4B**). A more gradual taper minimizes secondary tension vectors and also minimizes the appearance of the more medial incision. After incision of the flap, the flap is mobilized by careful blunt and sharp dissection, first at the leading and trailing edges to minimize bulldozing and tethering, respectively. Next, undermining is continued along the sides of the flap. The key is to mobilize the flap while maintaining a healthy, robust vascular pedicle, which tends to be located approximately between the first and second third of the flap (measured from the leading edge). Use of blunt dissection scissors turned vertically and spreading the scissors help to divide the tissue and minimize trauma to the blood vessels. Once adequately freed, the leading edge of the flap is secured with absorbable, buried vertical mattress sutures (**Fig. 6.4C**). The secondary defect is closed and the long sides of the triangle are likewise secured with several buried, absorbable sutures. Finally, the epidermis is approximated and everted with a 6-0 polypropylene running percutaneous or with simple interrupted sutures (**Figs. 6.4D and E**).

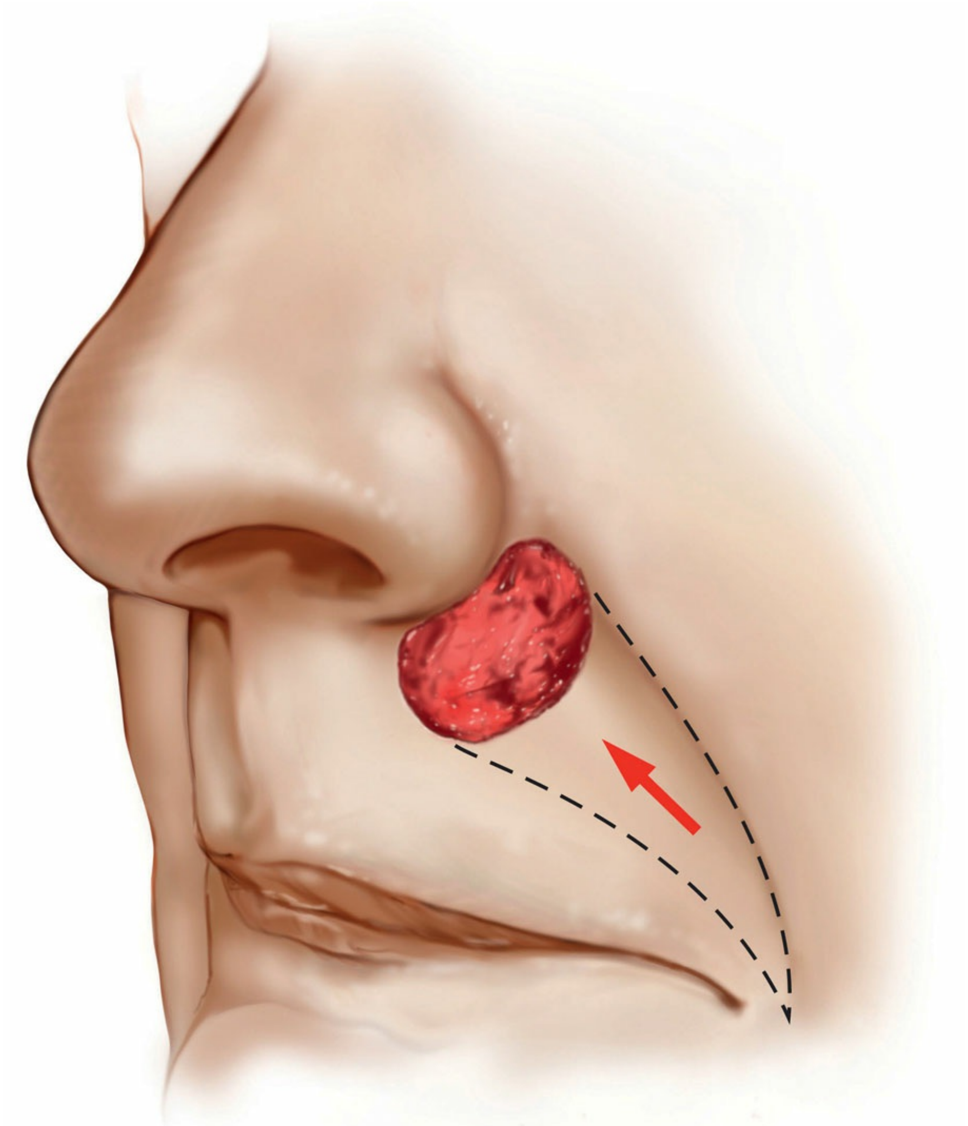


Figure 6.4B. Design of an island advancement flap. One long incision is placed within the melolabial furrow. Advancement of the flap into the defect will reconstruct the triangular peninsula of tissue that separates the nose, cheek, and lip.

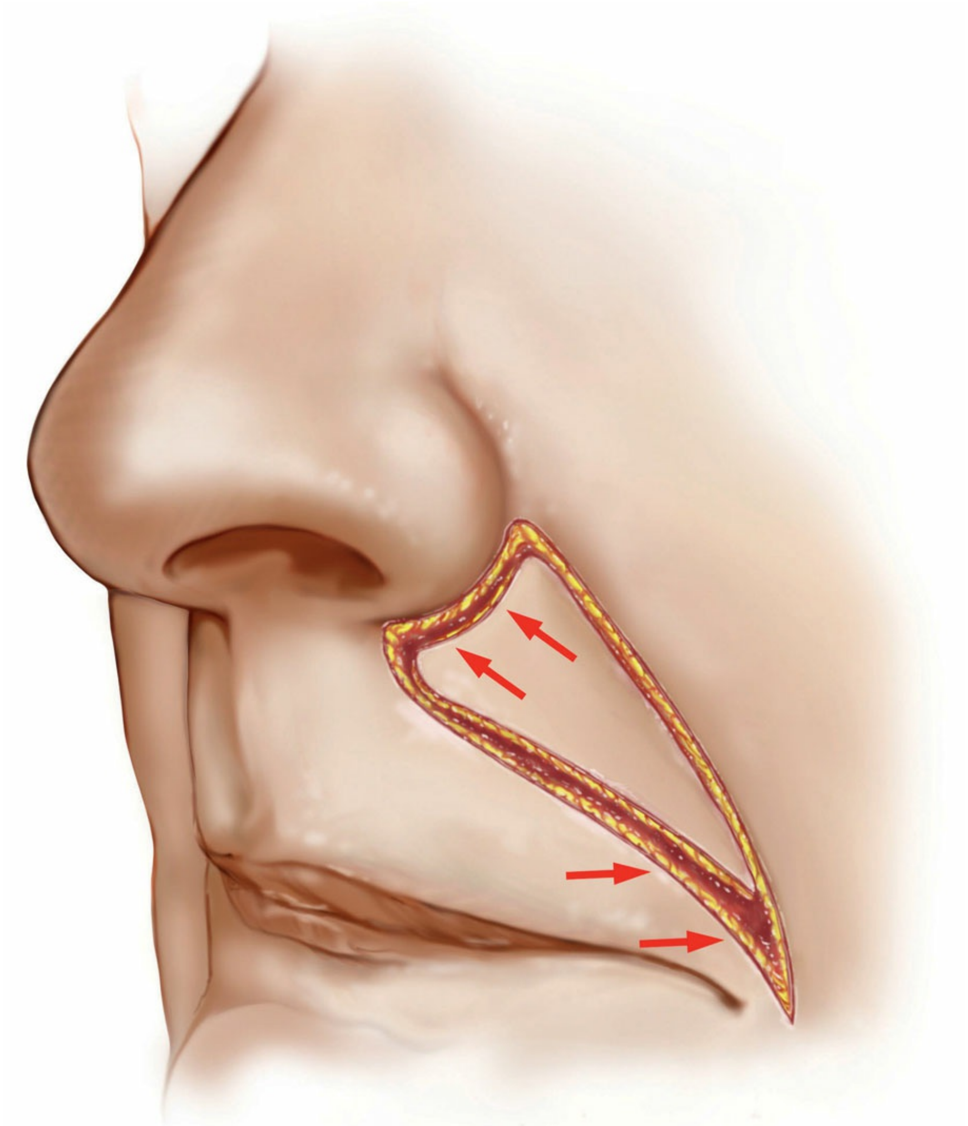


Figure 6.4C. Advancement of the flap. A long, tapering triangle decreases the secondary tension closure on the upper lip and makes the transition from cheek to upper lip natural in appearance.

Figure 6.4D. Island advancement flap sutured into place.

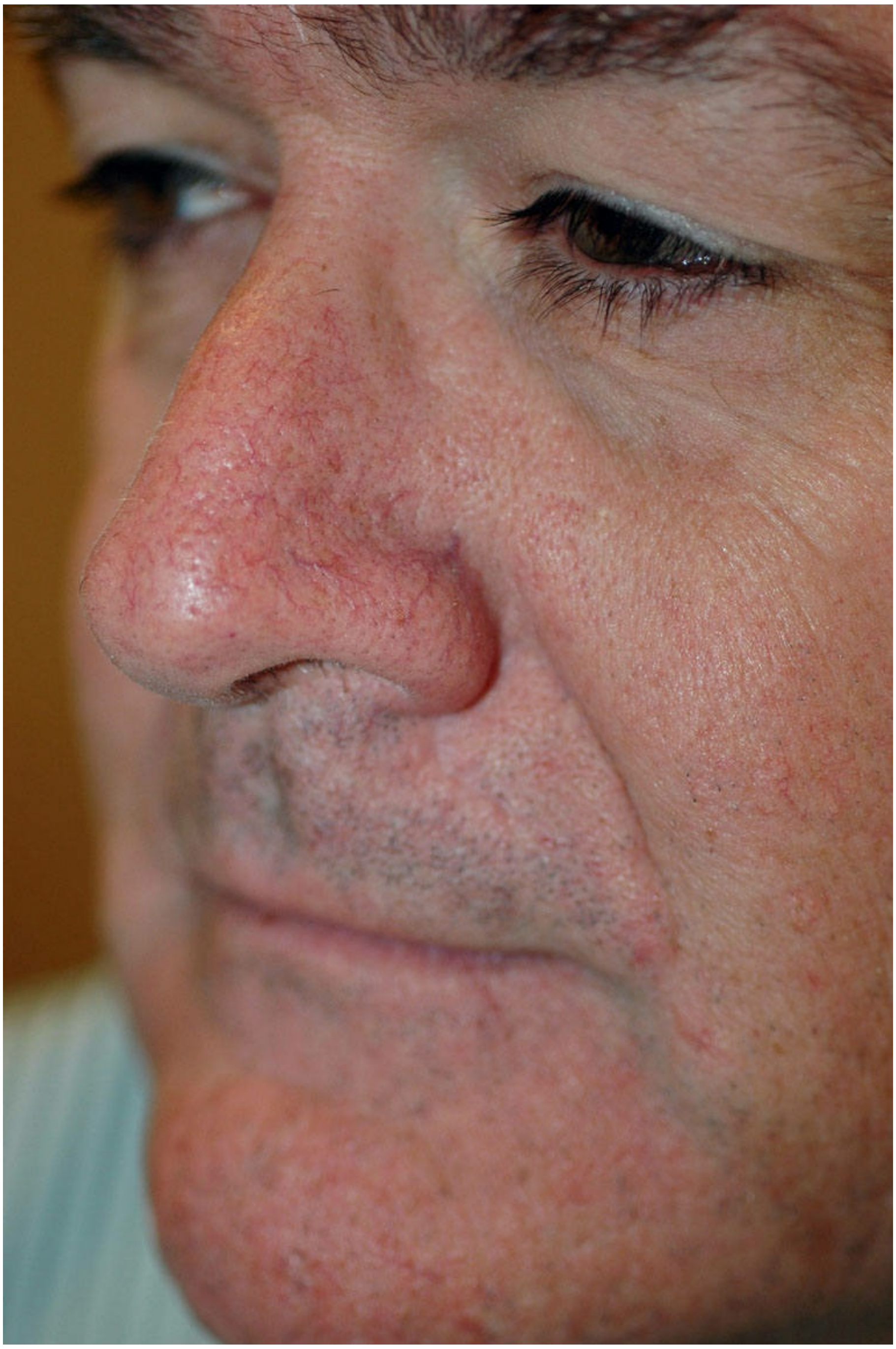


Figure 6.4E. Healed result shows incision line well hidden in melolabial furrow and good reconstruction of alar sill without blunting, which can be seen in some other types of repairs.

The second example is an unusual case with two basal cell carcinomas involving bilateral alar sills. The repairs demonstrate the utility of island advancement flaps in reconstruction of this important anatomical landmark, preserving the isthmus of tissue between the nose, cheek, and lip and concealing the incisions at the base and one long side of the triangular flap at the junction of anatomical units and within the melolabial

furrow (**Figs. 6.4F–K**).

Figure 6.4F. Following a four-stage Mohs procedure for a basal cell carcinoma, the surgical defect measures 1.9 × 1.9 cm.

Figure 6.4G. Design of the island advancement flap. One long incision follows the melolabial furrow, and a second long incision begins at the inferior aspect of the surgical defect, gradually tapering to where it meets the first incision in the melolabial furrow.

Figure 6.4H. Flap mobilized and advanced into the surgical wound and sutured into place with 4-0 polyglactin 910 buried, absorbable sutures. Trailing tail of the flap secured with 6-0 polypropylene half-buried horizontal mattress suture ("tip stitch"). Flap secured with additional buried, absorbable sutures and epidermis approximated and everted with 6-0 polypropylene running percutaneous suture.

Figure 6.4I. In the same patient 2 weeks later, the basal cell carcinoma on the right alar sill is treated, resulting in a 1.4 × 1.2 cm defect. At this time, wound care on the left side involves application of a sunscreen/silicone gel product and sun protection.

Figure 6.4J. Island advancement flap sutured into place on the right alar sill.

Figure 6.4K. Two months following surgery, incision lines are healing well, with mild erythema gradually fading, and alar sills are well reconstructed. (Immediately following surgery, routine wound care consisted of cleaning incision line with hydrogen peroxide and application of petrolatum and a nonstick bandage twice daily. After suture removal, sterile paper tape was applied over the incision line, and once this tape fell off, a silicone/sunscreen gel was applied twice daily.)

Key Points

- Island advancement flaps are useful for alar sill defects as one long incision line is placed within the melolabial furrow and the base

incision line is hidden within the alar sill. In addition, one of the base angles of the flap may function well to replace the missing triangle- or peninsula-shaped alar sill, which separates the nose, lip, and cheek.

- The long sides of the triangle should be elongated and gradually tapered to minimize secondary tension vectors and to produce a more natural transition between the cheek and lip.
- The flap at the leading, trailing, and lateral edges should be carefully undermined, maintaining a healthy vascular pedicle located in the broader portion of the flap. Undermining is complete when the leading edge of the flap can be secured without significant secondary tension or pull back.
- First, absorbable sutures should be used to secure the leading edge of the flap within the surgical defect, followed by closure of the secondary defects and finally securing the long edges of the triangle.

6.5 MIDUPPER LIP VERMILION AND MIDLOWER LIP VERMILION: VERMILIONECTOMY AND MUCOSAL ADVANCEMENT FLAP

This first defect measures approximately 2.2 × 1.1 cm and is located entirely within one cosmetic subunit on the upper lip: the vermilion (**Fig. 6.5A**). In addition, the patient has extensive sun damage, including changes of actinic cheilitis involving the upper lip. If the surrounding vermilion were healthy and not likely a source of future skin cancers, a repair utilizing the remaining vermilion tissue might be considered (e.g., Section 6.6), but instead, a vermilionectomy and mucosal advancement flap was selected. Apart from removing the precancerous changes on the upper lip, this procedure allows the repair to be completed within one cosmetic subunit and places the incision line along the border between two cosmetic subunits (i.e., vermilion and cutaneous lip) (**Figs. 6.5B and C**).

Figure 6.5A. Surgical defect measures 2.2 × 2.1 cm on the vermilion of the upper lip.

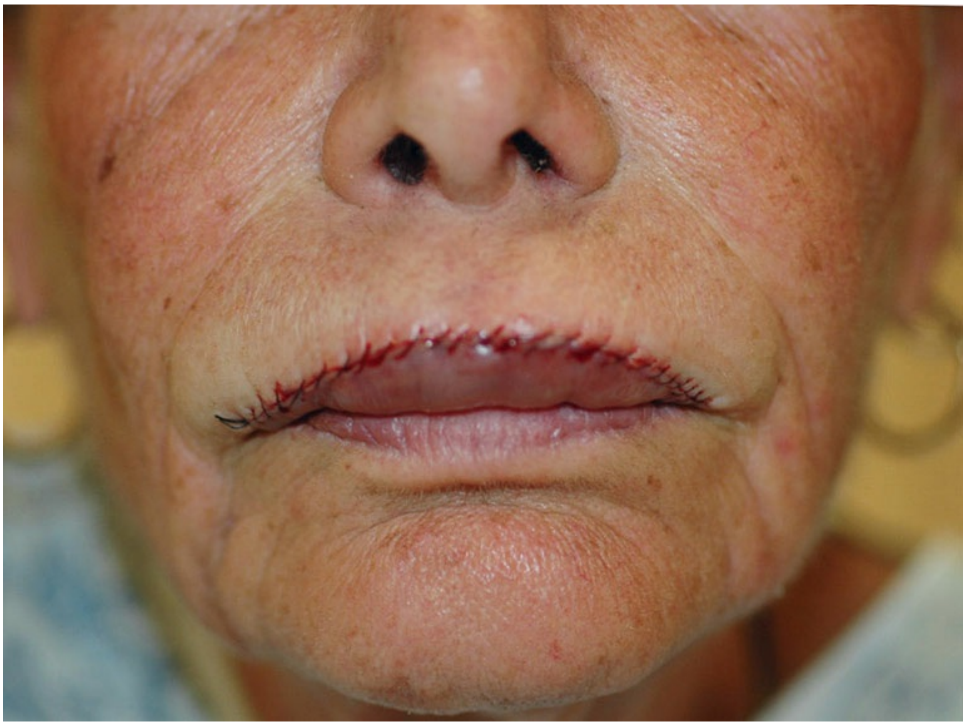


Figure 6.5B. The remaining vermilion was excised and the defect repaired with a mucosal advancement flap. The flap is mobilized by undermining deep to minor salivary glands but superficial to the orbicularis oris, taking care to avoid injury to

the labial artery. After being adequately mobilized, the flap is advanced into the surgical defect and secured with absorbable, buried sutures along the vermilion border. The epidermis is closed with a running 5-0 silk percutaneous suture, which is better tolerated than a synthetic suture (e.g., polypropylene) in this location.

Figure 6.5C. Final healed result.

Vermilionectomy and mucosal advancement flap are more common on the lower lip (**Figs. 6.5D–G**), but the same points should be kept in mind for the upper lip. First, preoperatively discuss with the patient some of the usual expectations following this repair. The lip will likely be thinner (i.e., anterior–posterior dimension reduced), and the color and texture of the

reconstructed vermilion will likely be more red and glossy. Not infrequently, patients might complain of numbness as some of the sensory nerves are transected at the time of vermilionectomy. In men, especially in repairs on the lower lip, there may be irritation to the upper lip caused by secondary tension vectors redirecting lower lip beard hairs more superiorly.

Figure 6.5D. A 70-year-old man with a 1.6 × 1.6 cm defect on the vermilion of the lower lip.

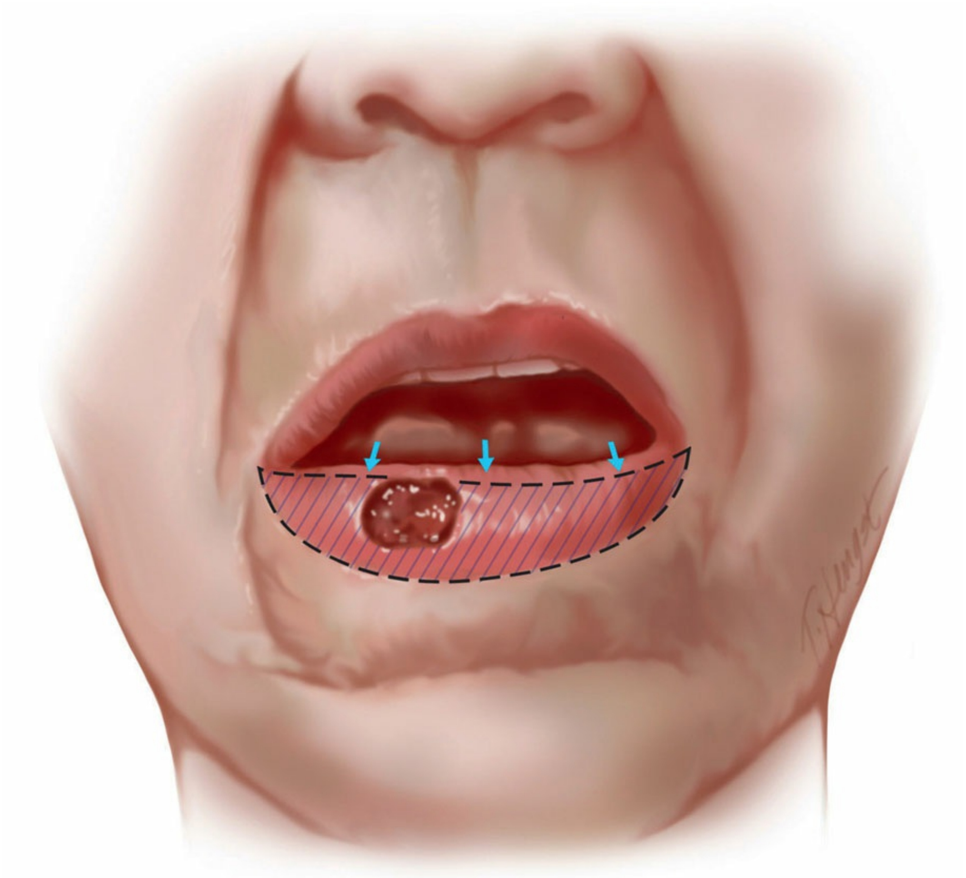


Figure 6.5E. Design of vermilionectomy and mucosal advancement flap. The actinically damaged, dry vermilion is excised in a crescentic fashion to the vermilion border (diagonal or hashed lines represent damaged vermilion that is excised). The wet vermilion and labial mucosa is carefully undermined by blunt dissection deep to the minor salivary glands, taking care to avoid trauma to the inferior labial artery. Undermining is continued to the gingival sulcus until the flap can be advanced to the vermilion border, where it is secured with 4-0 or 5-0 absorbable, buried sutures and 5-0 or 6-0 nonabsorbable silk running suture.

Figure 6.5F. Appearance immediately after vermilionectomy and mucosal advancement flap.

Figure 6.5G. Final healed result.

The first step is to surgically excise the damaged dry vermilion, sparing the wet vermilion (**Fig. 6.5E**). The repair is completed with the

reconstructed vermilion coming from the wet vermilion and labial mucosa. Undermining by blunt dissection should be deep to the minor salivary glands and superficial to the orbicularis oris, and the surgeon should avoid trauma to the labial artery. Undermining continues in this plane to the gingival sulcus to allow the wet vermilion and labial mucosa to advance into the surgical defect. Once undermining is complete, the mucosal advancement flap can be closed along the vermilion border with absorbable buried sutures and a silk running percutaneous suture (**Figs. 6.5B–C and F–G**).

Key Points

- Vermilionectomy and mucosal advancement flap are useful for defects that involve only the vermilion, and the remaining vermilion tissue is at high risk of future malignancies. (Deeper defects that involve orbicularis oris are likely better addressed by a wedge excision repair or lip-switch flap; see Sections 6.11 and 6.12.)
- Vermilionectomy generally requires removal of the remaining dry vermilion (from border of the wet and dry vermilion to the vermilion border).
- Transection of the labial artery should be avoided during vermilionectomy and undermining of the mucosal advancement flap. (Labial artery is usually found near the junction of the wet and dry vermilion between the orbicularis oris and mucosa or within the orbicularis oris itself.)
- Undermining should be deep to the minor salivary glands and superficial to the orbicularis oris, continuing to the gingival sulcus.
- Absorbable, buried sutures should be used to close along the vermilion border, and a soft percutaneous suture (e.g., silk) should be used to minimize irritation in the postoperative period.

6.6 MIDLOWER LIP VERMILION: BILATERAL VERMILION ROTATION FLAP

For defects limited to the vermilion but without significant adjacent actinic cheilitis, a bilateral vermilion rotation flap may be a suitable alternative. The repair was first detailed by the author in the scientific literature many

years ago(Kaufman AJ. Bilateral vermilion rotation flap. Dermatol Surg, 2006;32 (5):721–725). In an attempt to improve upon the cosmetic result and minimize hypoesthesia associated with mucosal advancement flaps, an alternative repair was designed that preserved the adjacent healthy vermilion. After all, this adjacent vermilion is the exact type of tissue missing and therefore would be the optimal tissue for repair (i.e., replacement for "what is missing").

In this example, the surgical defect on the lower lip spares the orbicularis oris and cutaneous lip (**Fig. 6.6A**). The remaining lower lip vermilion does not demonstrate significant actinic cheilitis. As a result, a bilateral vermilion rotation flap was designed. Rather than advancing tissue outward as seen in a mucosal advancement flap, the bilateral vermilion rotation flap rotates tissue centrally. The benefit of this maneuver is that the central lip maintains significant fullness. In addition, tissue of most similar characteristics is used in the reconstruction; most incisions are kept along the vermilion border, and there is less risk of hypoesthesia as a smaller amount of tissue is excised across the lip. Finally, in men there is little chance of beard hair redirection upward (for lower-lip repair) in contrast to mucosal advancement flaps, where the secondary tension vectors may redirect beard hair upward and irritate the upper lip.

Figure 6.6A. Following Mohs surgery for a squamous cell carcinoma in situ, the defect on the lower lip vermilion measures 2.4 × 1.3 cm. Whiteness to the

vermilion is secondary to anesthesia with epinephrine effect, rather than severe actinic cheilitis.

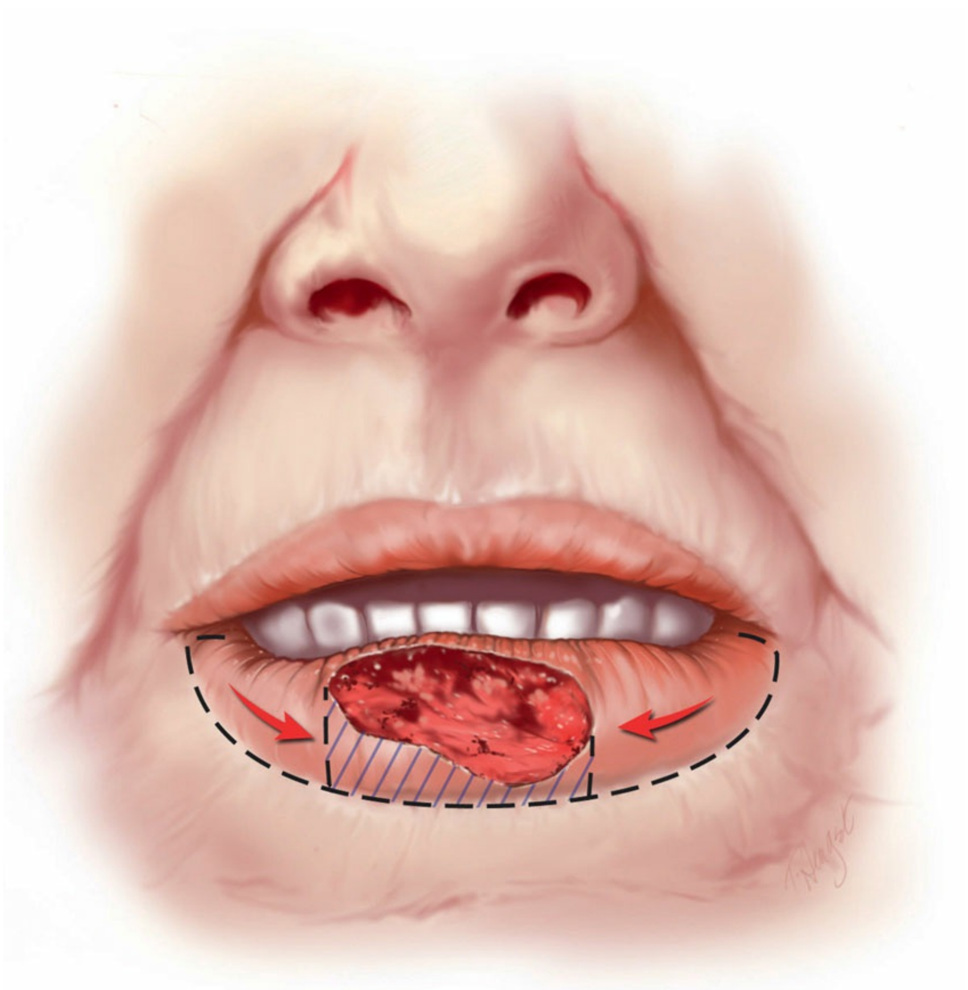


Figure 6.6B. Surgical defect enlarged anteriorly in this case so that repair is completed at the border of cosmetic subunits (hash marks indicate additional tissue excised). Incision of flaps follows the vermilion border bilaterally to the oral commissures, where a back cut facilitates mobilization of the flaps centrally.

While performing the repair, as with many other repairs, enlarge the defect if necessary so that incision lines are kept along the vermilion border. The incisions follow the vermilion border bilaterally to the oral commissures where a back cut is made to facilitate movement of the flap (**Fig. 6.6B**). The flaps are undermined by blunt dissection deep to the minor salivary gland, but posterior undermining only needs to be carried out to the labial mucosa. Once both flaps are mobilized, they are rotated centrally and secured with absorbable buried sutures (**Fig. 6.6C**). A series of absorbable sutures is placed at sites along the vermilion border, securing the vermilion to the vermilion border. A tricone or standing cone is excised in the central

lip, and this area and the vermilion border are closed with a 5-0 or 6-0 silk running percutaneous suture (**Figs. 6.6D and E**).

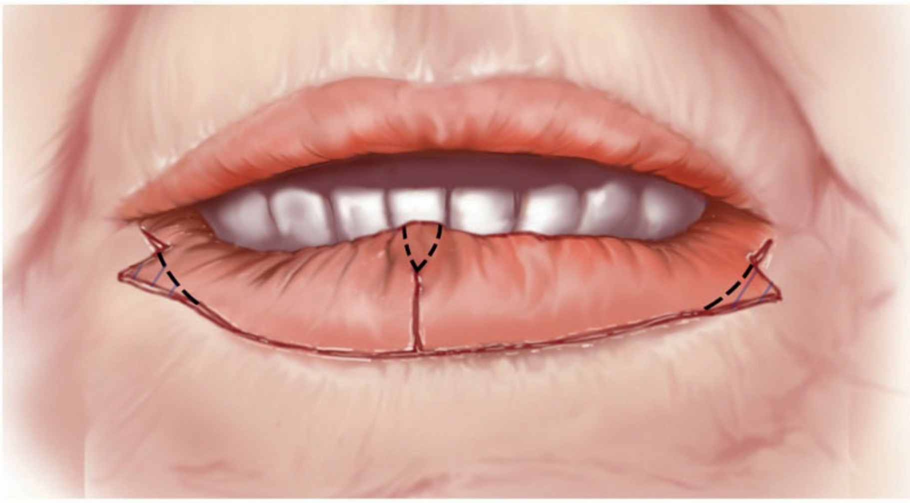


Figure 6.6C. After adequate undermining and hemostasis, the flaps are rotated centrally and sutured into place. A half-buried, horizontal mattress nonabsorbable suture (“tip stitch”) may be used where the two flaps meet at the vermilion border. Redundant tissue from the back cuts and rotation is removed (hash marks), and a standing cone or tricone is removed centrally on the posterior vermilion and labial mucosa. Several buried, absorbable sutures are placed to fix the flaps centrally and along the vermilion border, and a silk running percutaneous suture is used to approximate and evert the wound edges along the vermilion border and the central vermilion incision.

Figure 6.6D. Bilateral vermilion rotation flap sutured into place.

Figure 6.6E. Healed appearance demonstrates good match in color, texture, degree of actinic damage, and anterior–posterior fullness.

Key Points

- Bilateral vermilion rotation flap is an alternative to mucosal advancement flap repair for moderate-sized defects (<33% vermilion width) when remaining vermilion tissue is not at high risk of malignancy.
- By rotating tissue centrally and minimizing tissue transected across the vermilion, some of the problems associated with mucosal advancement flaps may be avoided.
- Transection of the labial artery should be avoided when undermining the flaps and excising the tricone or standing cone.

6.7 MIDUPPER LIP VERMILION AND PHILTRUM: ISLAND ADVANCEMENT FLAP AND BILATERAL VERMILION ROTATION FLAP

When presented with a defect that involves more than one cosmetic subunit, the best option for reconstruction will likely be a combination of

repairs, each repair reconstructing one cosmetic subunit. The same can be said for defects that extend to more than one cosmetic unit (e.g., nose and cheek)—consider repairing each cosmetic unit individually. By breaking down the defect into individual subunits or units, a more aesthetic result is likely. Repairs that bridge between cosmetic units (or subunits) create new boundaries, convexities, and concavities within those units (or subunits). For example, an advancement flap that repairs a defect involving nasal sidewall and medial cheek changes the location of borders between the nose and cheek, adds more fullness to the junction between the nose and cheek (nasomelal fold), and makes one side of the nose asymmetric to the other when viewed head-on. A better option for a defect involving nasal sidewall and medial cheek may be a combination of repairs that respects the borders between units and maintains concavities, convexities, and symmetry.

Figure 6.7A. Surgical defect following Mohs surgery of a basal cell carcinoma measures 2.3 × 2.0 cm and involves two cosmetic subunits, the vermilion and philtrum.

For this particular defect, the cutaneous aspect of the lip (primarily the philtrum) was repaired with an island advancement flap, and the vermilion was repaired with a bilateral vermilion rotation flap (**Fig. 6.7A**). The island advancement flap for philtrum repair was published by the author in the literature many years ago with Dr. Roy Grekin. The flap is useful for

defects that involve at least 50% of the side-to-side philtral width and places incision lines at roughly the same location as the philtral ridges, extending upward to the base of the columella. After careful and adequate mobilization, the triangular island advancement flap is advanced downward to the position of the projected vermilion border (**Fig. 6.7B**; see also Section 6.4 for a discussion of mobilization of this type of flap). The portion of the defect involving the vermilion is reconstructed from two rotation flaps from adjacent vermilion tissue (**Figs. 6.7B and C**). By rotating tissue centrally to fill the defect, the central fullness or anterior–posterior dimension of the central lip is better maintained than would result from a mucosal advancement flap. As a result of these two repairs, the defect is repaired in individual cosmetic subunits, similar tissue is used to reconstruct each subunit, and incision lines are fairly well placed at location of borders between cosmetic subunits (**Fig. 6.7D**). All of these factors help in improving the final cosmetic and functional result of the reconstruction (**Fig. 6.7E**).

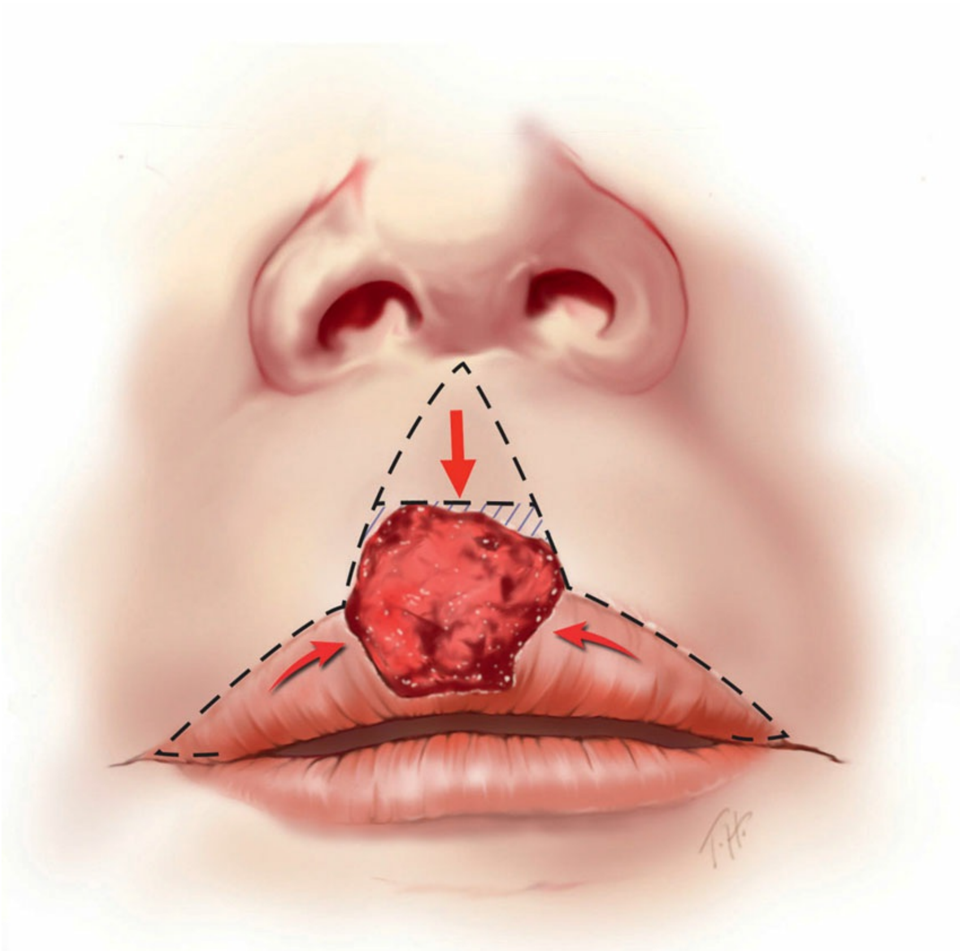


Figure 6.7B. Design of the repair consists of two repairs, one reconstructing the philtrum and the other reconstructing the vermilion. An island advancement flap repairs the philtrum, and a small amount of tissue at its base is sacrificed so that the

repair follows the vermilion border (hash marks indicate additional tissue excised). The vermilion is repaired with a bilateral rotation flap, similar in design to the example in Section 6.6.

Figure 6.7C. Appearance of flaps moved into place. With the island advancement flap, it is particularly important to adequately mobilize the flap and avoid secondary tension vectors that could deviate the lip upward. Redundant tissue that crossed the vermilion border when the flaps rotated centrally can be carefully excised (indicated by hash marks).

Figure 6.7D. Immediate postoperative appearance with island advancement flap and bilateral vermilion rotation flaps sutured into place.

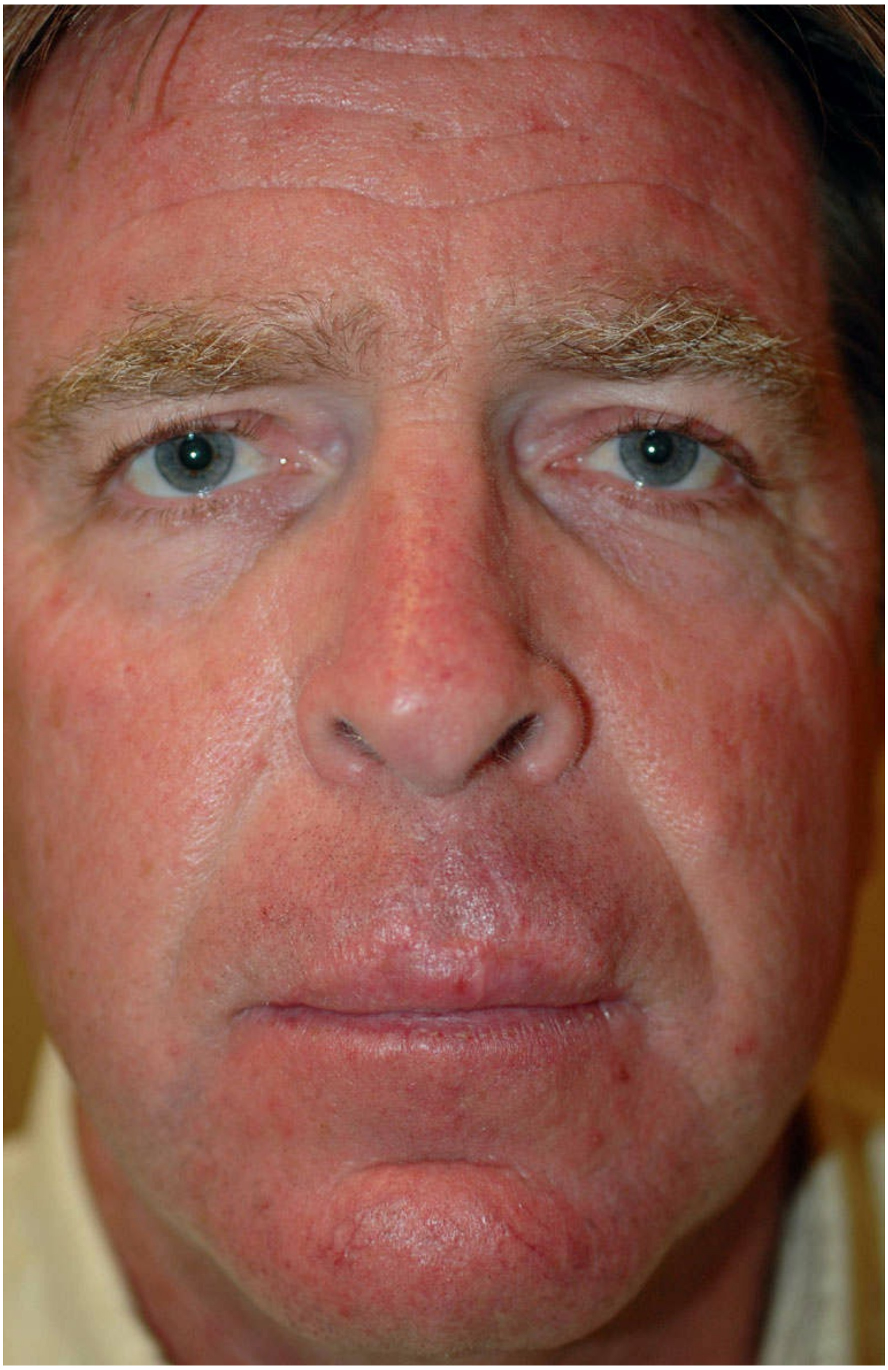


Figure 6.7E. Short-term healed appearance in patient with moderately severe actinic damage.

Key Points

- Defects that involve more than one cosmetic subunit (or unit) may be better repaired with more than one flap, graft, or side-to-side repair, with each repair focused on reconstructing one cosmetic subunit (or unit).
- An island advancement flap may be a good alternative for cutaneous

lip defects that primarily involve the philtrum. Mobilization of the flap is similar to other island advancement flaps (see Section 6.4). The flap should be adequately mobilized so that there is minimal secondary tension vectors (i.e., pull back), while at the same time a healthy vascular pedicle must be preserved.

- The island advancement flap is advanced to the planned vermilion border, and the vertices of the flap base are secured to the neighboring vermilion border.
- A bilateral rotation flap may be used for reconstruction of the upper lip vermilion in the same fashion as the lower lip vermilion (see Section 6.6).

6.8 MIDUPPER LIP VERMILION AND PHILTRUM: ISLAND ADVANCEMENT PINCER FLAP AND MUCOSAL ADVANCEMENT FLAP

This defect is slightly different from the example in Section 6.7 and employed a variation of that repair for reconstruction. The defect involves the same two cosmetic subunits, but the vast majority of the defect involves the philtrum and only a smaller amount involves the vermilion (**Fig. 6.8A**). As a result, the vermilion could be easily reconstructed using a small mucosal advancement flap, rather than a bilateral vermilion rotation flap. The larger share of this defect involves the philtrum and was reconstructed with a variant of the island advancement flap referred to as a "pincer flap" (**Figs. 6.8B and C**). Originally described by Dr. David Brodland (Flaps. In: Bolognia JL, Jorizzo JL, Rapini RP (eds). Dermatology. 3rd edn, Elsevier Saunders, 2012), the pincer flap is an island advancement flap whose base corners are rotated centrally in an attempt to reconstruct the concavity seen in most youthful philtrums (**Figs. 6.8C and D**). Although it does not always succeed in adding concavity to the flap and it may slightly decrease the width of the reconstructed philtrum, it is a nice endeavor to improve upon the island advancement flaps for philtral repair (**Figs. 6.8D and E**).

Figure 6.8A. Surgical defect involves the philtrum and small amount of vermilion.

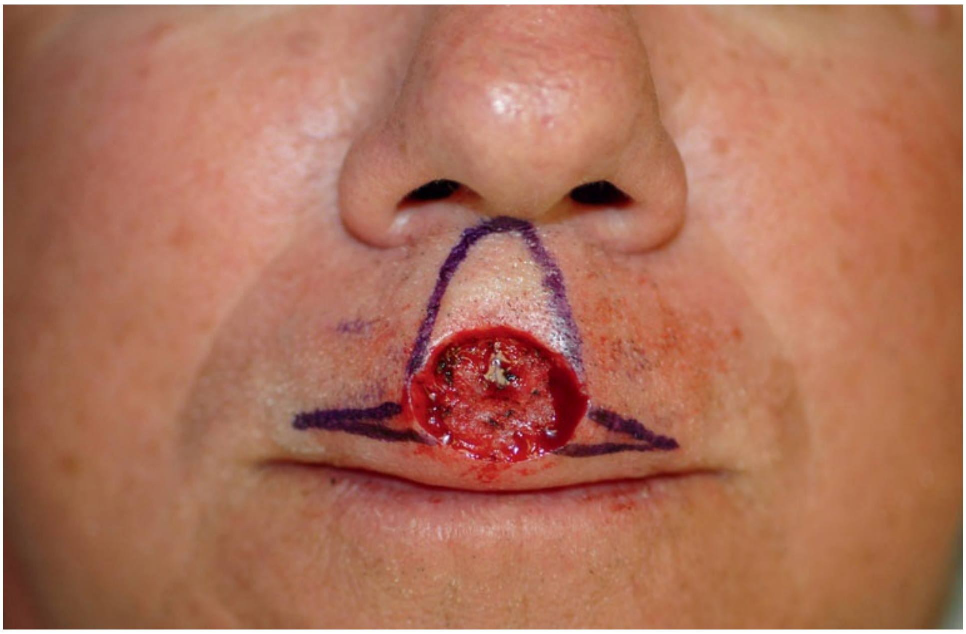


Figure 6.8B. Design of repair, using island advancement flap (pincer variant) and mucosal advancement flap. The apex of the island advancement flap can extend to the base of the columella or even onto the columella slightly.

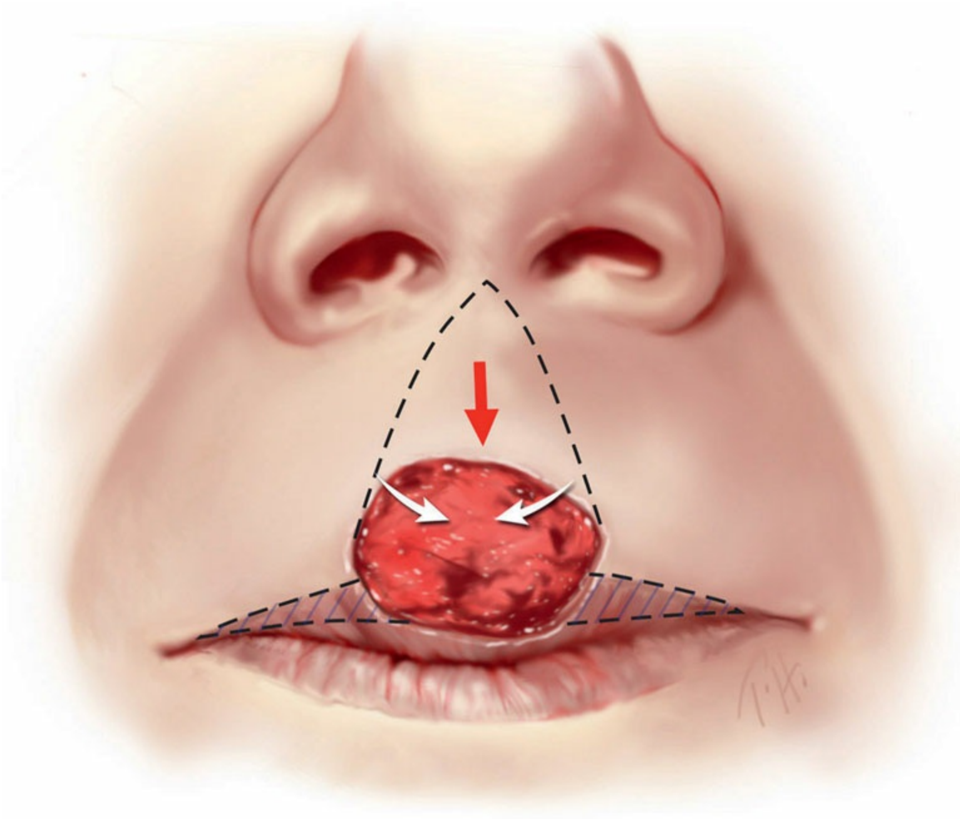


Figure 6.8C. As the island advancement flap is moved inferiorly, the two base corners of the flap are rotated centrally and sutured together, creating a concave philtrum. The vermilion is repaired with a mucosal advancement flap (hash marks indicate tissue excised on the vermilion).

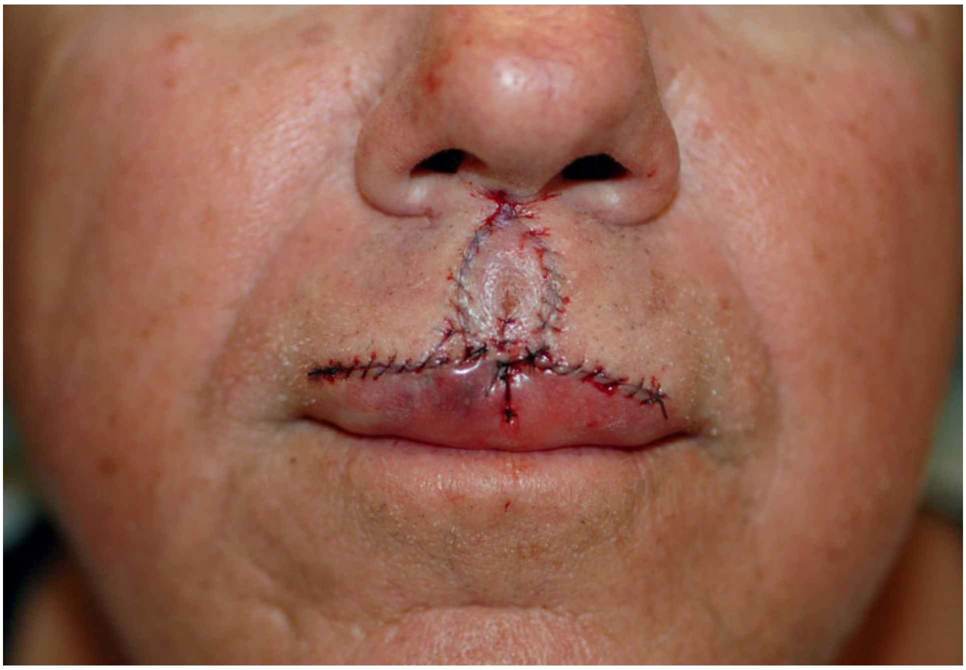


Figure 6.8D. Immediate postoperative appearance of the island advancement flap (Pincer variant) and mucosal advancement flap to repair the upper lip.

Figure 6.8E. Final healed result.

Key Points

- The defect involved more than one cosmetic subunit; so more than one repair was utilized to reconstruct the defect, with each repair responsible for reconstruction of a single cosmetic subunit.
- As the vermilion defect was relatively small, a small mucosal advancement flap was employed to reconstruct the vermilion.
- The residual tapering peninsulas of healthy tissue at the base of the planned island advancement flap provided the idea to rotate and secure the tips centrally, creating a concavity to the philtral flap. This has been previously referred to as a “pincer flap,” and otherwise is completed in a manner similar to an island advancement flap for philtral repair (see Section 6.7).

6.9 MIDUPPER LIP: BILATERAL ADVANCEMENT FLAP

Following a seven-stage Mohs procedure for an aggressive and recurrent basal cell carcinoma, this large surgical defect on the midupper lip measures 2.8 × 2.1 cm and is located in the skin and subcutaneous tissue

only, sparing muscle and adjacent vermilion (**Fig. 6.9A**). The defect extends beyond the boundaries of the philtrum and is too large for side-to-side repair or even a unilateral advancement flap. A full-thickness skin graft would resurface the defect but would not replace hair-bearing skin with similar hair-bearing skin, and the color, texture, and degree of actinic damage would not match the missing skin of the upper lip. The best option given these limitations is to borrow laxity from the lateral lip and medial cheek bilaterally. In reality, the loose tissue ultimately comes from the medial cheek by way of the lateral lip as there is insufficient lax tissue remaining on the lip to close the defect. Important aspects to consider when performing this repair (**Fig. 6.9B**) include the following: (1) Expand the defect (i.e., enlarge to base of nose) so that incision lines are placed at the junction of cosmetic units/subunits; (2) Incisions are carried to the medial cheek, where excision of tricones is placed so that they fall within rhytides or furrows, and (3) Undermining is carried onto the medial cheek as this is ultimately from where you borrow loose tissue.

Figure 6.9A. Large cutaneous defect of the midupper lip.

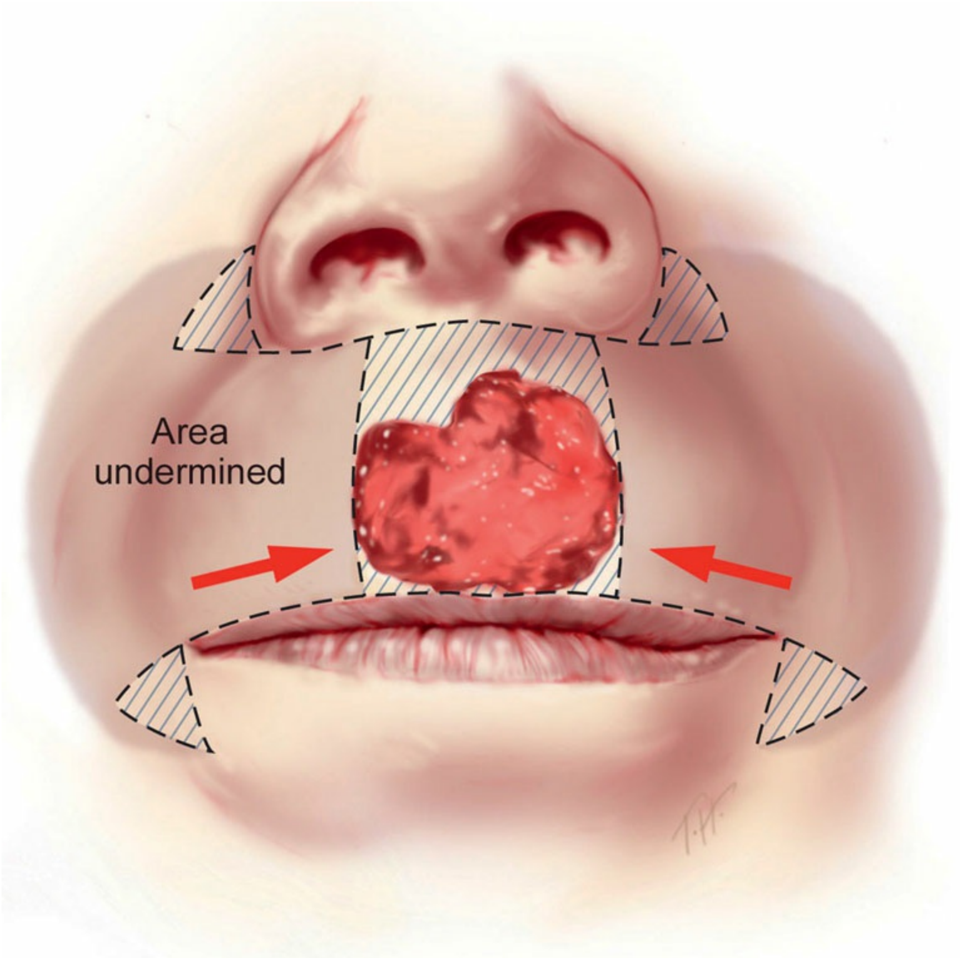


Figure 6.9B. Design of the bilateral advancement flap. Defect is expanded so that repair is completed at junctions of cosmetic units or subunits. Undermining is continued onto the medial cheek where lax tissue is greatest (undermining indicated by shaded area). Hash marks indicate tricones and additional tissue excised to facilitate advancement of flaps.

With adequate undermining to the medial cheek and excision of suitable tricones, a bilateral advancement flap can reconstruct a fairly large defect on the upper lip (**Fig. 6.9C**). A broad-based pedicle is maintained to the flaps (i.e., length-to-width ratio of 3:1 or less and trauma is avoided to neurovascular structures when undermining in the superficial subcutaneous fat or when creating incisions). Once adequately mobilized, the flaps are advanced centrally and sutured together with buried, absorbable sutures (e.g., 4-0 polyglactin 910). Additional buried, absorbable sutures are placed to close the tricones and along the flaps to help secure the repair in place. Finally, the epidermis is approximated and everted with nonabsorbable running or simple interrupted sutures (e.g., 6-0 polypropylene). When healed, the bilateral advancement flap can provide a fairly good reconstruction with hair-bearing skin of similar color, texture,

and thickness (**Fig. 6.9D**).

Key Points

- When necessary, consider expanding a surgical defect so that incision lines (and resultant scars) and repairs are completed within a cosmetic subunit (see also Figs. 5.11H–N as another example of expanding the surgical defect so that the repair is performed in one cosmetic subunit).
- Recruiting tissue bilaterally helps avoid excessive strain on a unilateral repair and maintains symmetry.
- Tricones should be placed where they will be well hidden (e.g., alar sill or marionette lines).
- Undermining should continue to the medial cheek in the superficial subcutaneous plane, avoiding trauma to neurovascular structures. A broad base to the flap pedicle and appropriate flap length-to-width ratio should be maintained.

Figure 6.9C. Bilateral advancement flap completed. Tricone excisions fall within marionette creases and at base of the ala attachment to the alar sill.

Figure 6.9D. Final healed result. Most incision lines are well hidden at junctions or within rhytides. It is difficult, if not impossible, to reconstruct the missing philtrum in this case, but the repair was able to provide hair-bearing skin that matched the surrounding color, texture, and thickness.

6.10 LOWER LIP: MELOLABIAL TRANSPOSITION FLAP (INFERIOR-BASED PEDICLE)

This surgical defect on the lateral lip measures 2.0 × 1.5 cm and is a good example to run through our basic evaluation process for reconstruction (**Fig. 6.10A**). First, **what is missing?** The answer is primarily cutaneous lateral lower lip. Underlying muscle and adjacent vermilion are intact, and the tissue is not hair-bearing for this elderly woman. Second, **where can the replacement tissue be found?** The loose tissue in this case is obviously located lateral and/or inferior to the defect. **And finally, how can you move the tissue from where it is located to where it is needed and how best can you hide the incision lines or scars?** In answering this final question, a repair that is not going to disturb nearby free margins (e.g., vermilion border) or anatomical landmarks (e.g., oral commissure) through the effect of secondary tension vectors should be designed, and incision lines in rhytides, furrows, and junctions should be utilized when possible. A well-designed transposition flap is an excellent choice for moving tissue without distorting free margins; so a transposition flap was designed, recruiting tissue from the medial cheek. The flap was designed

so that closure of the secondary defect would fall within the melolabial fold, and excision of the tricone would trail off into the mental crease (**Fig. 6.10B**). By considering these factors (and with the help of the patient's innumerable facial rhytides and prominent furrows), a quite acceptable reconstruction can result (**Fig. 6.10C**).

Figure 6.10A. Surgical defect on the cutaneous lateral lower lip.

Figure 6.10B. A transposition flap from the medial cheek recruits adequate tissue for repair and minimizes risk of free margin deviation. Incision of the flap and excision of the tricone are placed in areas where they will be well hidden.

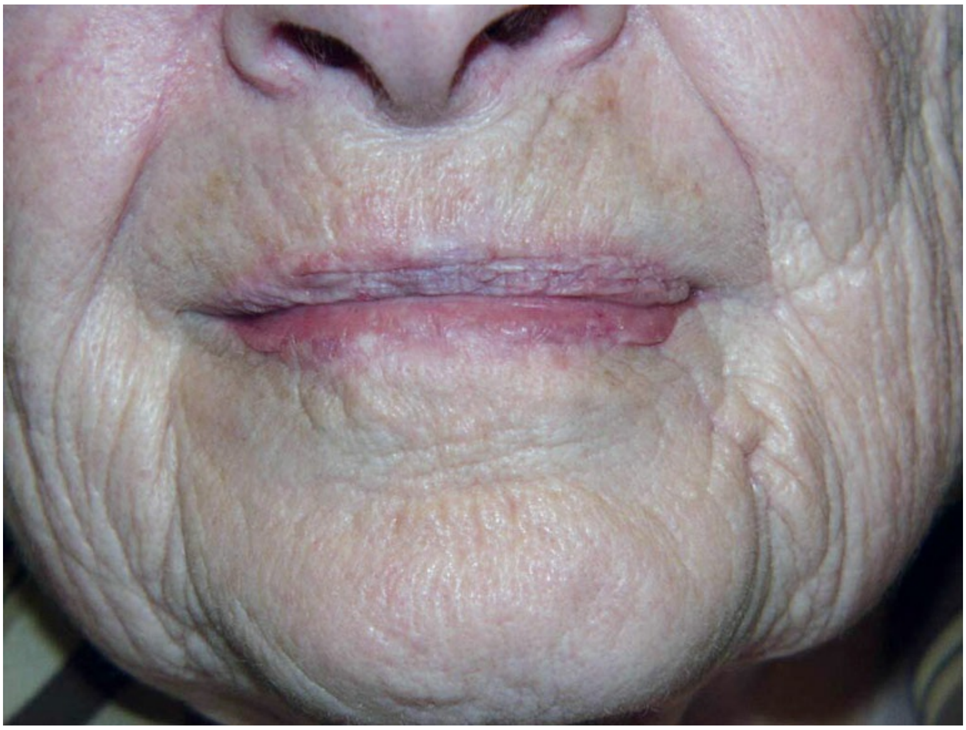


Figure 6.10C. Healed result. Incision lines hidden among patient's rhytides and no deviation of the lip margin or oral commissure.

Key Points

- In evaluating this surgical site, it became clear that missing tissue primarily consists of cutaneous lateral lower lip and that the potential replacement tissue is lateral or inferior to the defect. Once that is determined, one just needs to decide how to move the needed tissue to where you want it without distorting nearby free margins or landmarks, while placing incision lines in rhytides, furrows, or junctions.

6.11 LOWER LIP: WEDGE EXCISION

This man was left with a 2.7 × 1.5 cm defect involving the lower lip following Mohs surgery for a recurrent squamous cell carcinoma (**Fig. 6.11A**). The defect is deeper and requires more than resurfacing of the involved vermilion or cutaneous lip. Because of the size and depth of the defect, a wedge excision repair was designed to reconstruct the lower lip. Defects up to about 33% of the lower lip horizontal length (and 25% of the upper lip) can be reconstructed with a wedge excision repair. Larger defects would likely require repair with a lip-switch flap, like the Abbe flap (see Section 6.12).

In this section, we start by designing a full-thickness wedge excision of the lower lip. An M-plasty was designed to keep the excision from crossing the labiomental crease (**Fig. 6.11B**). An experienced assistant is particularly helpful here as the full-thickness excision transects the inferior labial artery, and the assistant maintains pressure until the vessel can be ligated or carefully cauterized. After the wedge is removed and hemostasis achieved, the wound must be closed in layers, including mucosa, orbicularis, subcutaneous, and cutaneous. As a general rule, the author prefers closure of the orbicularis oris first to better approximate the wound and remove tension on the other closures (**Fig. 6.11C**). As with other lip repairs, the vermilion border must be carefully realigned, and if there is significant discrepancy in width between the newly approximated vermilions, a small tricone can be excised from the side with the wider vermilion. A 5-0 or 6-0 silk suture is utilized for the vermilion and mucosal surfaces (**Fig. 6.11D**). While percutaneous sutures (e.g., 6-0 polypropylene) in the cutaneous lip are removed by 7 days, the mucosal sutures may be left in place for up to 2 weeks (**Fig. 6.11E**).

Figure 6.11A. Surgical defect on the lower lip involves approximately 30% of the horizontal length of the lower lip.

Figure 6.11B. The assistant grasps and holds both sides of the lip near the incision while wedge excision with M-plasty is performed. Gauze is used to prevent the assistant's fingers from slipping while flap is incised and inferior labial artery is cauterized or ligated.

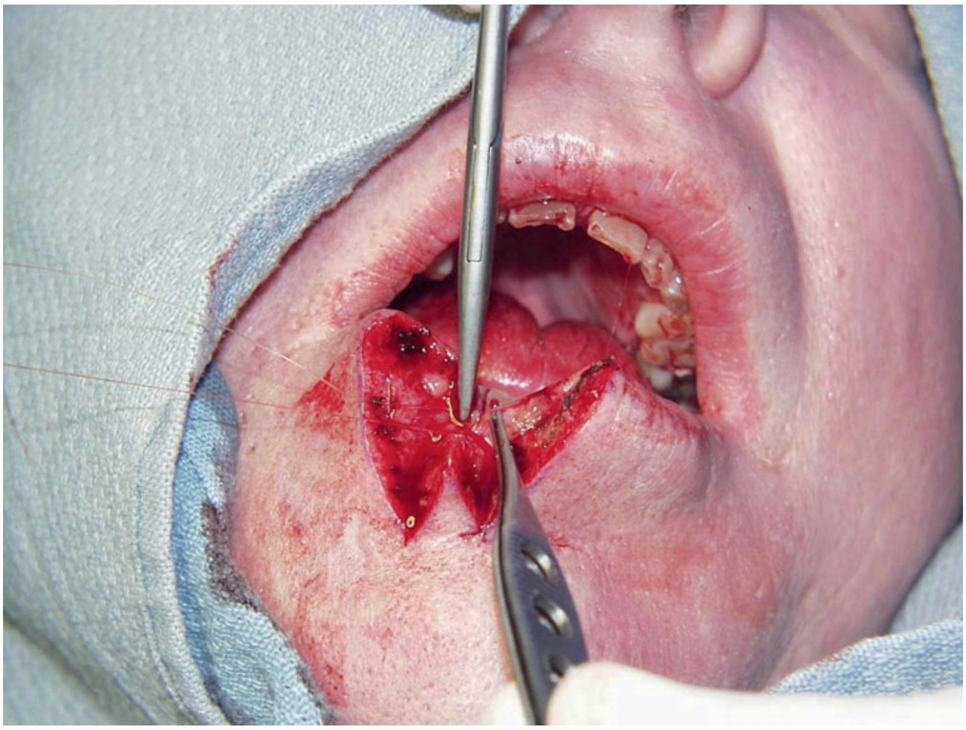


Figure 6.11C. Full-thickness defect needs to be closed in layers, starting with orbicularis oris to approximate wound edges and remove tension from other closures. Next, closure of subcutaneous tissue also with absorbable suture. And finally, closure of the cutaneous surface (be sure to accurately approximate the vermilion border) and mucosal surface.

Figure 6.11D. Appearance immediately post-op. Note that M-plasty prevents incision from crossing mental crease; vermilion border is well approximated and silk suture is used for vermilion and mucosa (softer and more comfortable than

polypropylene, which is used for cutaneous closure).

Figure 6.11E. Healed appearance.

Key Points

- Wedge excision repair may be useful for defects of up to about 25% of the upper lip or 33% of the lower lip horizontal length.
- A well-trained assistant makes lip-wedge excision much easier by stabilizing the lip and maintaining compression on the labial artery until it is identified and ligated or cauterized.
- An M-plasty may be used to prevent the wedge excision from crossing the labiomental crease.
- The defect should be closed in layers beginning with the orbicularis oris, which will close the defect more quickly and remove tension while closing other layers.
- The vermilion border should be carefully realigned, and if necessary, a small tricone of vermilion can be removed from one side of the lip to correct discrepancies in vermilion anterior–posterior fullness between the medial and lateral lip.
- Silk sutures are used on the vermilion and mucosal surfaces as they are softer and less likely to cause irritation to the patient.

6.12 UPPER LIP: ABBE–ESTLANDER (LIP-SWITCH) FLAP

This elderly patient presented with a recurrent basal cell carcinoma that had failed numerous prior attempts at surgical excision over the preceding 9 years (**Fig. 6.12A**). Signs of eclabium had been present for at least 2 years. The patient underwent a four-stage Mohs surgical procedure to remove the persistent skin cancer. The resultant surgical defect involved a large, full-thickness portion of the lateral upper lip and tracked down the melolabial furrow onto the oral commissure and marionette line (**Fig. 6.12B**).

The defect involves more than 40% of the horizontal length of the lateral upper lip and partial thickness of the oral commissure. While wedge excision repairs are useful for defects of up to about 25% of the upper lip (33% on the lower lip), larger defects may require repair with a lip-switch reconstruction. The most common of these repairs is the Abbe flap, which is capable of reconstructing defects between 25% and 50% of the horizontal length of the lip. The premise is simple: recruit a well-vascularized interpolation flap from the donor lip that measures between 50% and 75% of the horizontal length of the defect on the recipient lip (**Fig. 6.12C**). Because there is no underlying bony or cartilaginous support, a flap half the length of the defect can be utilized as long as functional requirements are met. As a result, the repair of the defect is essentially shared between the upper and lower lip, and balance in the size, proportion, and symmetry of the lips is maintained.

Figure 6.12A. Preoperative appearance of a multiple recurrent basal cell carcinoma on the right upper lip.

Figure 6.12B. Immediate postoperative appearance following Mohs micrographic surgery to remove the malignancy. Tumor involved full-thickness right lateral upper lip and traced down the melolabial furrow, involving the oral commissure and right lateral lower lip.

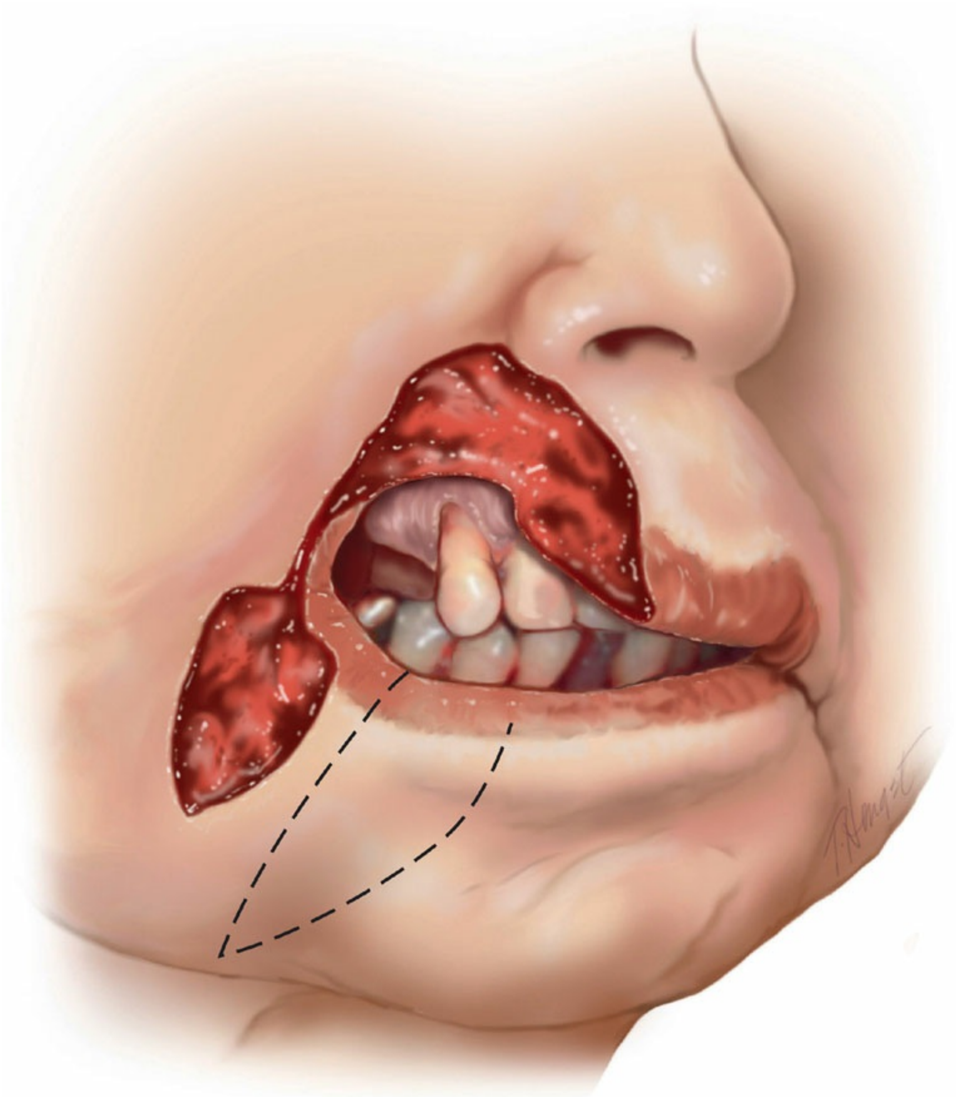


Figure 6.12C. Design of the Abbe–Estlander lip-switch flap. Defect involving marionette line is closed in a side-to-side fashion and remainder of upper lip and oral commissure is repaired with the lip-switch flap. The flap length and shape is created to fill the full-thickness defect of the upper lip, including the alar sill. The horizontal lip length of the flap needs to be only 50% to 75% of the recipient horizontal lip length, but the height of the flap must be long enough to repair the full height of the defect including the alar sill.

Figure 6.12D. After closure of the marionette-line defect and the secondary defect of the lip-switch flap, the flap is transposed into the surgical defect on the upper lip. A healthy vascular pedicle is maintained on the posterior vermilion and labial mucosa, which incorporates the inferior labial artery. For both donor and recipient sites, it is important to carefully reapproximate the vermilion border and close the wounds in layers.

The blood supply for this pedicle flap is based on the inferior labial artery. Generally, in a typical Abbe flap, the pedicle is located on the side that allows less twisting of the flap and provides the maximum oral aperture for the 3 to 4 weeks that the pedicle is left intact. In this example, the medial side was selected for the pedicle in order to reconstruct the oral commissure, a procedure sometimes referred to as the Estlander variant or flap (**Fig. 6.12D**). The inferior labial artery is usually located on the posterior aspect of the lip near the junction of the wet and dry vermilion and either between the orbicularis oris and labial mucosa or within the

orbicularis oris itself. As with wedge excision repair, an assistant stabilizes and compresses the artery when the flap is begun. By incising the full-thickness side of the flap first (i.e., lateral aspect of the flap in this example), the inferior labial artery can be identified and ligated or cauterized, and the location of the artery within the pedicle can be anticipated during the mobilization of the flap. The incision on the pedicle side (i.e., medial side in this example) will cross the vermilion border onto dry vermilion but avoid cutting into the orbicularis oris or potential territory of the artery. As a result, the vermilion border on the lower lip can be well approximated in the first stage, and the pedicle will originate more on the posterior vermilion and labial mucosa.

As with other transposition or interpolation flaps, the donor site is closed initially in an identical manner to a wedge excision repair. First, the orbicularis oris is closed, which decreases the size of the defect and removes tension from closure of other layers. Following this, the vermilion border is accurately approximated; subcutaneous absorbable sutures are placed on the cutaneous lip, and percutaneous running sutures approximate and evert the mucosa, vermilion, and cutaneous lip (**Fig. 6.12E**).

The flap is transposed into the recipient site, and if necessary, the defect is enlarged or the flap trimmed to fit. In this case, because the defect involved the full height of the cutaneous upper lip extending into the alar sill, it was important that the shape and height of the donor flap recreate this region. As with the donor site, the recipient site is closed in the same layered fashion, reapproximating orbicularis oris first followed by subcutaneous and percutaneous sutures, accurately aligning and suturing the vermilion border.

Figure 6.12E. Immediate postoperative appearance after side-to-side closure (marionette areas) and Abbe–Estlander flap (upper lip). As the defect involves the oral commissure, there is no division-and-inset stage, only a second procedure for commissuroplasty.

Figure 6.12F. Appearance before commissuroplasty at 4 weeks following surgery. Vermilion borders are well approximated, and functional recovery is evident in both the donor and recipient lips.

At 3 to 4 weeks, the pedicle is divided and inset in a typical Abbe flap. Reconstruction of the particular defect in this example included restoration of the oral commissure, making this a variant of the Abbe flap, sometimes referred to as an Estlander flap. In an Estlander variant, the second stage is not used to divide and inset the pedicle, because the pedicle functions like an oral commissure. Instead, a commissuroplasty may be performed at 4 to 8 weeks to finesse the final result (**Figs. 6.12F–H**).

Figure 6.12G. Immediately after right oral commissuroplasty to improve symmetry and mobility.

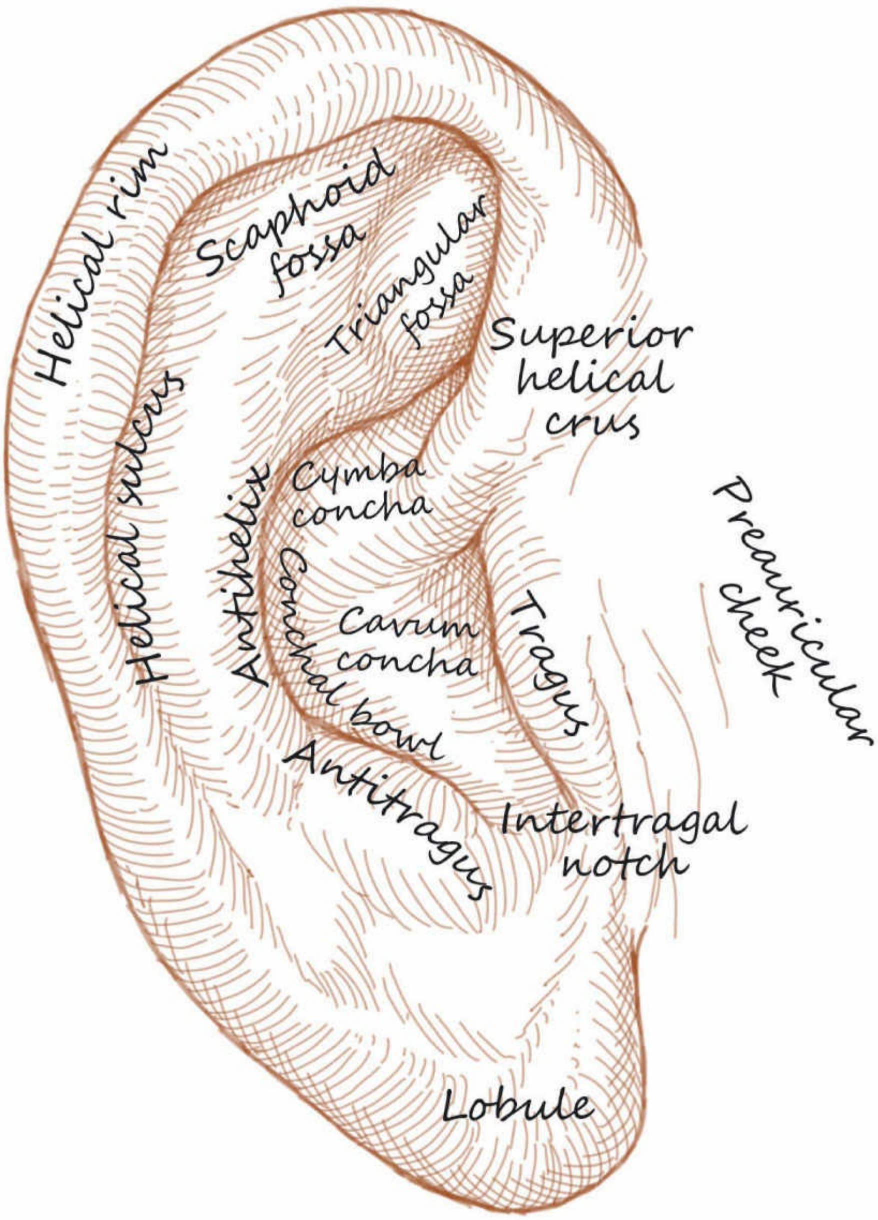
Figure 6.12H. Healed appearance at 4 months demonstrates good mobility and oral aperture with good aesthetic appearance to upper and lower lips.

Key Points

- Lip-switch flaps, like the Abbe or Estlander flap, can repair full-thickness defects involving between 25% and 50% of the horizontal length of the lip.
- A smaller flap (50% to 75% of horizontal lip length of the defect) can be used to reconstruct the defect; however, the height of the flap should match the height of the defect.
- Blood supply is based on the labial artery, which runs near the junction of the wet and dry vermilion between the orbicularis oris and labial mucosa or within the orbicularis oris intrinsically.
- An experienced assistant stabilizes and compresses the lip, and the first incision should be through the full-thickness side of the flap (i.e., nonpedicle side). This allows identification of the precise route of the labial artery and facilitates localization when working on the pedicle side.

- The incision on the pedicle side is full-thickness until it approaches the territory of the labial artery. The pedicle containing the labial artery should be situated on the posterior aspect of the vermilion and adjacent labial mucosa. The cutaneous incision may cross the vermilion border (making reapproximation of the border easier); but to avoid damage to the blood supply, incising into the adjacent orbicularis or the posterior vermilion should be avoided.
- The donor site should be closed in layers and before transposition of the flap to the recipient lip.
- For repairs that leave a pedicle between the donor and recipient lips, division and inset of the pedicle can be performed at 3 to 4 weeks. For repairs that include reconstruction of the oral commissure (i.e., Estlander variant), commissuroplasty can be performed at 4 to 8 weeks.

7 Ear Reconstruction



The ear is a complex structure whose lateral surface provides minimal loose tissue for side-to-side or flap repair. The skin on this side is bound down to a convoluted cartilaginous structure with convex and concave surfaces. As such, repair on the lateral surface is usually limited to second

intention healing, skin graft, or a flap from the medial pinna or other nearby cosmetic unit (i.e., preauricular cheek or postauricular scalp). The skin on the medial surface of the ear is a little looser and may provide adequate tissue for side-to-side or flap repair of small- to medium-sized defects, although flap repair frequently recruits tissue from the postauricular sulcus area. The helical rim provides the characteristic shape to the pinna, and reconstruction is most successful if the shape, size, and appearance of this contiguous structure is maintained. Fortunately, for many defects on the helical rim, the inferior helical rim and lobule provide an adequate reservoir of loose tissue from which to fashion a local flap repair.

7.1 HELICAL RIM: SIDE-TO-SIDE REPAIR

Smaller defects often require simpler repairs. This small defect on the helical rim (**Fig. 7.1A**) is easily closed with a side-to-side or complex linear repair (**Figs. 7.1B and C**). Especially in older patients, side-to-side repair may be an excellent alternative in cases where flap reconstruction might have to be considered. Areas with significant laxity and redundant tissue combined with adequate undermining (e.g., in this case on the posterior pinna) can facilitate closure in a side-to side fashion (**Figs. 7.1D–F**).

Key Points

- Side-to-side or complex linear closure may work well for small- to medium-sized defects of helical rim, lobule, or postauricular sulcus defects, especially in older patients with redundant tissue.
- Over a curved surface such as the helical rim, the usual 3:1 length-to-width ratio for closure of a side-to-side wound may have to be increased to 4:1 or more to avoid a persistent standing cone or tricone at the pole(s) of the incision.

Figure 7.1A. Surgical defect helical rim.

Figure 7.1B. Utilizing lax or redundant tissue in this elderly patient, a side-to-side repair easily repairs the defect. The length of the elliptical excision may need to increase to 4:1 or 5:1 length-to-width ratio to avoid a persistent standing cone at either end of the repair.

Figure 7.1C. Final healed result.

Figure 7.1D. Larger surgical defect on the helical rim.

Figure 7.1E. Widely undermining on the medial pinna and the adjacent loose and redundant tissue allow the wound to be closed in a side-to-side fashion. At the same time, the length-to-width ratio is increased to avoid a persistent standing cone along the helical rim.

Figure 7.1F. Healed result. Slightly thinner helical rim but overall very good cosmetic result.

7.2 MEDIAL PINNA: TRANSPOSITION FLAPS (RHOMBIC AND BILOBED)

Defects on the medial pinna too large to close in a side-to-side fashion can be repaired with a transposition flap, ultimately recruiting loose tissue from the postauricular sulcus. For defects *adjacent* to the sulcus, a rhombic transposition flap can be designed to reconstruct the defect, transposing

tissue over the uninvolved skin of the medial pinna (**Figs. 7.2A–F**). For defects *distant* from the postauricular sulcus, a bilobed transposition flap can effectively "walk" tissue from the postauricular sulcus across the medial pinna to the surgical defect (**Figs. 7.2G–K**). Use of a transposition flap helps to minimize secondary tension vectors that could distort the delicate cartilaginous framework of the pinna.

Figure 7.2A. Surgical defect on the right medial (or posterior) pinna adjacent to the helical sulcus.

Figure 7.2B. Rhombic transposition flap sutured into place. Flap taken from postauricular sulcus superior to the surgical defect. Tricone left intact to avoid compromise of pedicle as the angle of transposition is relatively greater in this particular repair. In addition, removal of tricone is less aesthetically important in this hidden location.

Figure 7.2C. Healed result.

Figure 7.2D. Larger surgical defect on the posterior or medial pinna and adjacent to the postauricular sulcus.

Figure 7.2E. Rhombic transposition flap recruiting tissue from the postauricular sulcus and sutured into place. The postauricular sulcus contains a “bank” of tissue from which to borrow, both for flap and graft repair.

Figure 7.2F. Final healed result on medial pinna.

Figure 7.2G. Larger surgical defect on the left medial pinna distant to the postauricular sulcus.

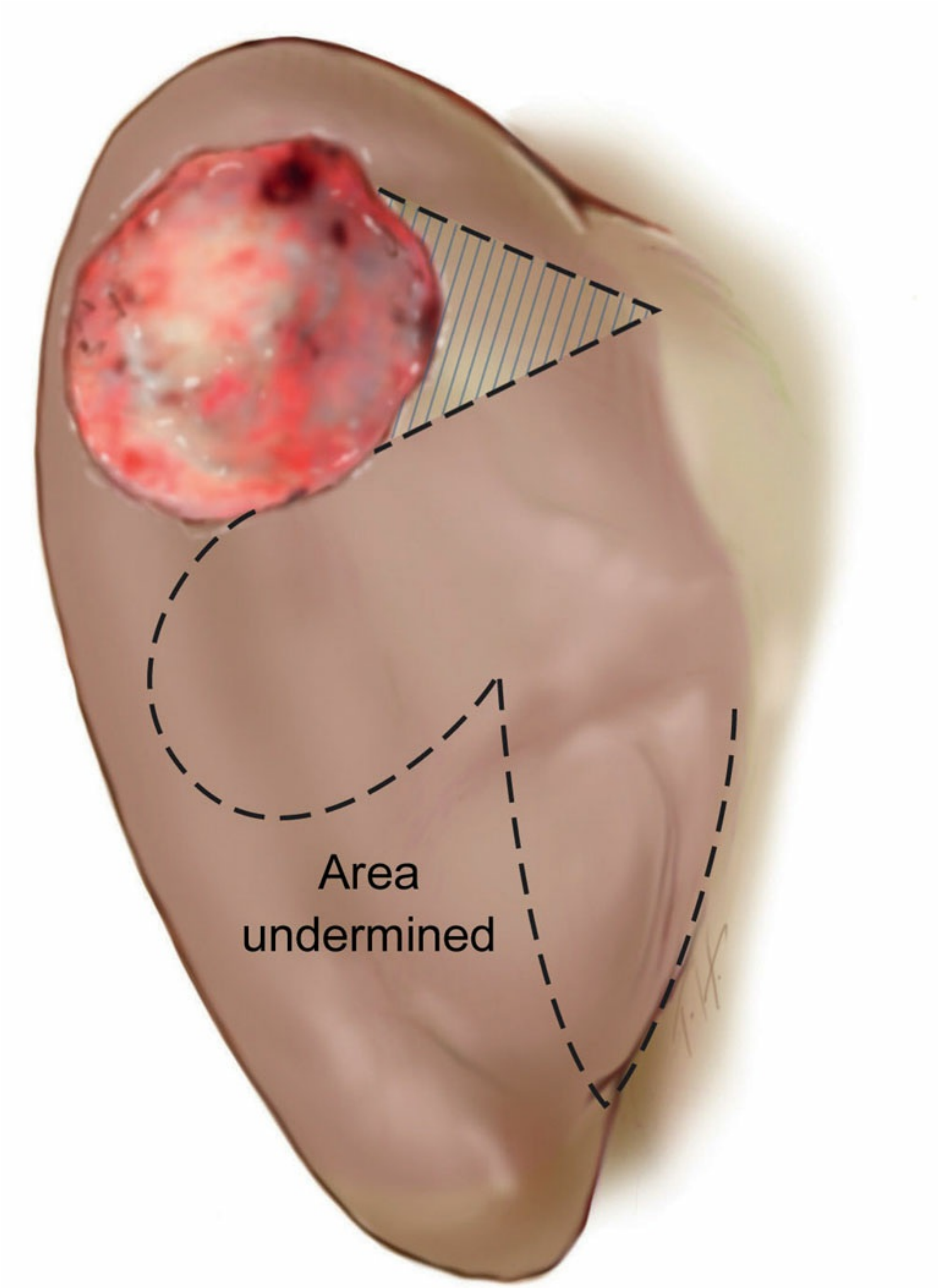


Figure 7.2H. Design of bilobed transposition flap moves tissue from the postauricular sulcus to surgical defect. (For details on bilobed transposition flaps design, see Section 5.4.) The lobes are approximately the same size as the defect, and the angle between the defect and the first lobe or the first and second lobes is approximately 45 to 50 degrees. The second lobe is within the postauricular sulcus, effectively “walking” or transposing tissue across the medial pinna to the surgical defect.

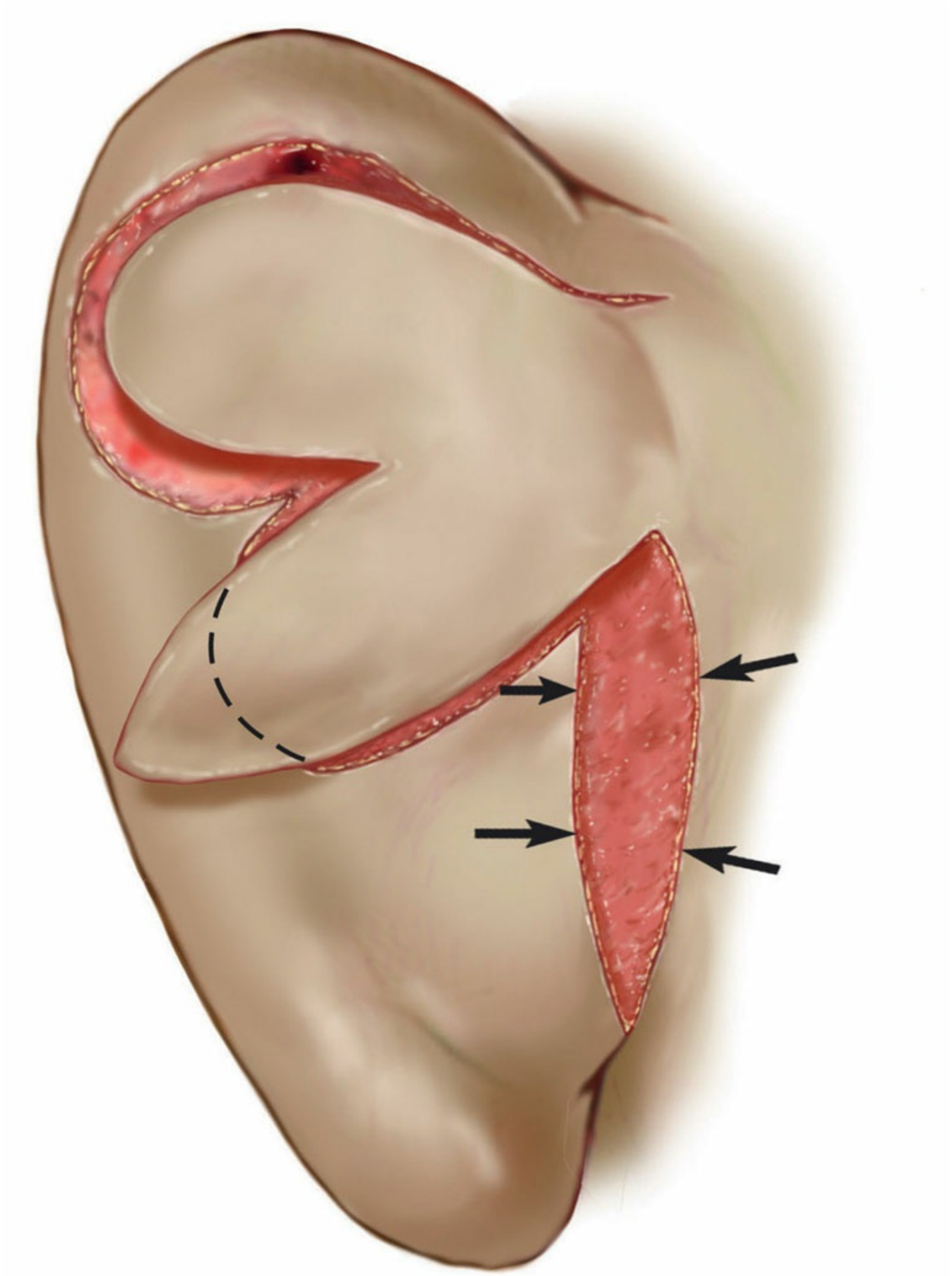


Figure 7.2I. The secondary defect in the postauricular sulcus is closed first, causing the two lobes to transpose into the defect of the first lobe and the surgical defect.

Figure 7.2J. Bilobed transposition flap sutured into place.

Figure 7.2K. Final healed result.

Key Points

- Defects on the medial (or posterior) pinna too large for side-to-side repair can be repaired with a transposition flap.
- If a defect is adjacent to the postauricular sulcus, a rhombic transposition flap can be designed. For defects away from the postauricular sulcus, a bilobed transposition flap can effectively walk tissue across the pinna.

7.3 TRAGUS (AND CONCHAL BOWL): PREAURICULAR TRANSPOSITION FLAP

This postoperative defect on the posterior or medial aspect of the tragus could be repaired in a number of ways (**Fig. 7.3A**). A full-thickness skin graft would reconstruct the defect but would require neovascularization or "take" of the skin graft on exposed cartilage. A flap provides its own blood supply, and therefore the chance of a successful repair on exposed cartilage is greater.

The preauricular cheek holds a reservoir of loose tissue for most people, especially in older patients. This 76-year-old man had enough loose tissue in the preauricular cheek to allow creation of a transposition flap, which would transpose around the tragus and repair the defect on the medial aspect of this structure (**Figs. 7.3B and C**). As with other transposition flap repair, proper planning is key to ensure that an adequate amount of tissue is transposed and that it reaches all of the edges of the surgical defect. Like other transposition flaps, closure of the secondary defect first allows the flap to more easily transpose into place, essentially "falling" into the surgical defect.

Figure 7.3A. Surgical defect on the medial aspect of the tragus.

Figure 7.3B. Preauricular transposition flap transposed around tragus to repair the defect. Donor site is the glabrous portion of the preauricular cheek. Flap is designed so that closure of the secondary defect places the incision line in the pretragal crease.

Figure 7.3C. Healed view of the ear.

The same type of repair may be useful for a defect on the inferior aspect of the conchal bowl, the main requirement being that the available tissue is adequate to complete the repair and that the defect is adjacent to the donor site (pretragal cheek). In this second example, the defect is located on the inferior aspect of the conchal bowl extending toward the external auditory meatus (**Fig. 7.3D**). The transposition flap allows for faster healing of the conchal bowl and decreases scar contracture that might constrict the EAM or tragus (**Figs. 7.3E and F**).

Figure 7.3D. Surgical defect on the inferior aspect of the conchal bowl, extending to the external auditory meatus (blood-soaked cotton ball in the external auditory canal).

Figure 7.3E. Preauricular transposition flap utilized to reconstruct surgical defect pivoting around the tragus and placed in the intertragal notch.

Figure 7.3F. Healed result. Flap repair helps minimize potential scar contracture around the external auditory meatus.

Key Points

- Preauricular skin may be a good donor site for flaps (in addition to its traditional role as donor site for full-thickness skin grafts).
- For defects in the conchal bowl, second intention healing should be considered (e.g., Section 7.4) unless the defect involves the EAM or unless scar contracture may cause distortion of the ear. Donor sites for conchal bowl defects include preauricular or postauricular tissue for grafts or flaps (e.g., Sections 7.3 and 7.5).

- The preauricular transposition flap should be designed so that the flap transposes around the tragus with the pedicle crossing the intertragal notch. Closure of the secondary defect (i.e., site of the flap) should fall within the pretragal crease.

7.4 CONCHAL BOWL (AND TRIANGULAR FOSSA): SECOND INTENTION HEALING

Second intention healing may be an excellent alternative for defects in concave areas, including the conchal bowl. One caveat is that if the defect approximates the EAM, especially encircling at least 50% of the EAM, graft or flap repair should be considered to decrease the possibility of constriction of the EAM and potential impact on hearing. Likewise, large defects or defects near free margins might be better off with flap or graft repair to decrease the chance that scar contracture might distort the free margin.

In the first example, the surgical defect involves the entirety of the cavum of the conchal bowl, avoiding the area of the EAM (**Figs. 7.4A and B**). The second example is a larger defect involving the triangular fossa but far enough away from free margins (e.g., helical rim) to entertain the option of second intention healing (**Fig. 7.4C**). In this second example, small, 3-mm circular pieces of cartilage were removed in the wound bed to facilitate granulation of the wound through the transcartilaginous migration of granulation tissue from the subcutaneous tissue on the medial pinna (**Figs. 7.4D and E**). Both examples demonstrate that second intention healing may be an excellent alternative for specific surgical defects on concave surfaces. A third and final example involving the area between the scaphoid and triangular fossae show that even over a convex surface second intention healing may be a good consideration for repair as long as there is no impact upon structure or function (**Figs. 7.4F and B**).

Figure 7.4A. This 88-year-old female was left with a 2.5 × 1.5 cm defect involving the conchal bowl following Mohs surgery of a basal cell carcinoma.

Figure 7.4B. Final healed result by second intention healing.

Figure 7.4C. Surgical defect of the triangular fossa extending to the underlying perichondrium.

Figure 7.4D. Cartilage is fenestrated to allow granulation tissue from the medial pinna to migrate to the surgical defect and facilitate granulation over the exposed perichondrium. Patients *must* keep the wound moist (e.g., petrolatum) and covered with a nonstick bandage throughout the healing process.

Figure 7.4E. Final healed result.

Figure 7.4F. Surgical defect extending between the triangular and scaphoid fossae.

Figure 7.4G. Final healed result with good cosmetic outcome.

Key Points

- Second intention healing may be a good option for reconstruction for concave surfaces, including the conchal bowl, and triangular or scaphoid fossae.
- Fenestration of the exposed cartilage can be used to facilitate transcartilaginous migration of granulation tissue and expedite healing.

- Defects involving the EAM should be considered for repair to avoid scar contracture and narrowing of the EAM.

7.5 CONCHAL BOWL (AND TRIANGULAR FOSSA): POSTAURICULAR PULL-THROUGH FLAP

Another surgical defect in the conchal bowl is seen in this example, but this one necessitated the removal of the conchal cartilage in the surgical treatment of an aggressive and neglected squamous cell carcinoma (**Figs. 7.5A and B**). The cartilage in this area is not necessary for structural support of the pinna, and in fact, the conchal cartilage is sometimes used as a donor site for structural cartilage grafting in nasal or auricular repair. Repair options for this surgical defect would include second intention healing or repair by graft or flap. Second intention healing was not chosen because the wound was large and deep, and to avoid scar contracture and a prolonged healing phase. A full-thickness skin graft would have reconstructed the surface and healed more quickly, but the choice was made to perform a postauricular pull-through flap, which would reconstruct the wound quickly and reconstruct depth as well as a durable surface.

Figure 7.5A. This 76-year-old man presented with a neglected squamous cell carcinoma of the conchal bowl of the right ear.

Figure 7.5B. The surgical defect involved a large portion of conchal bowl and cartilage after Mohs surgical excision of an aggressive squamous cell carcinoma.

A postauricular pull-through flap provides a well-vascularized island flap, based on branches of the postauricular artery. The flap is usually centered over the postauricular sulcus. The elliptical flap is incised and the flap is mobilized, taking care to maintain an adequate vascular pedicle (**Fig. 7.5C**). If cartilage was not removed during skin cancer surgery, a portion of cartilage is excised to allow the flap to be passed through to the lateral or anterior aspect of the ear (**Fig. 7.5D**). Once coverage and reach of the

flap is ensured by careful blunt dissection around the flap and pedicle, one or two sutures are placed to hold the flap in the surgical defect and prevent it from slipping back to the medial or posterior aspect of the ear. The donor site is closed, and the flap is trimmed and sutured into place (**Figs. 7.5E and F**).

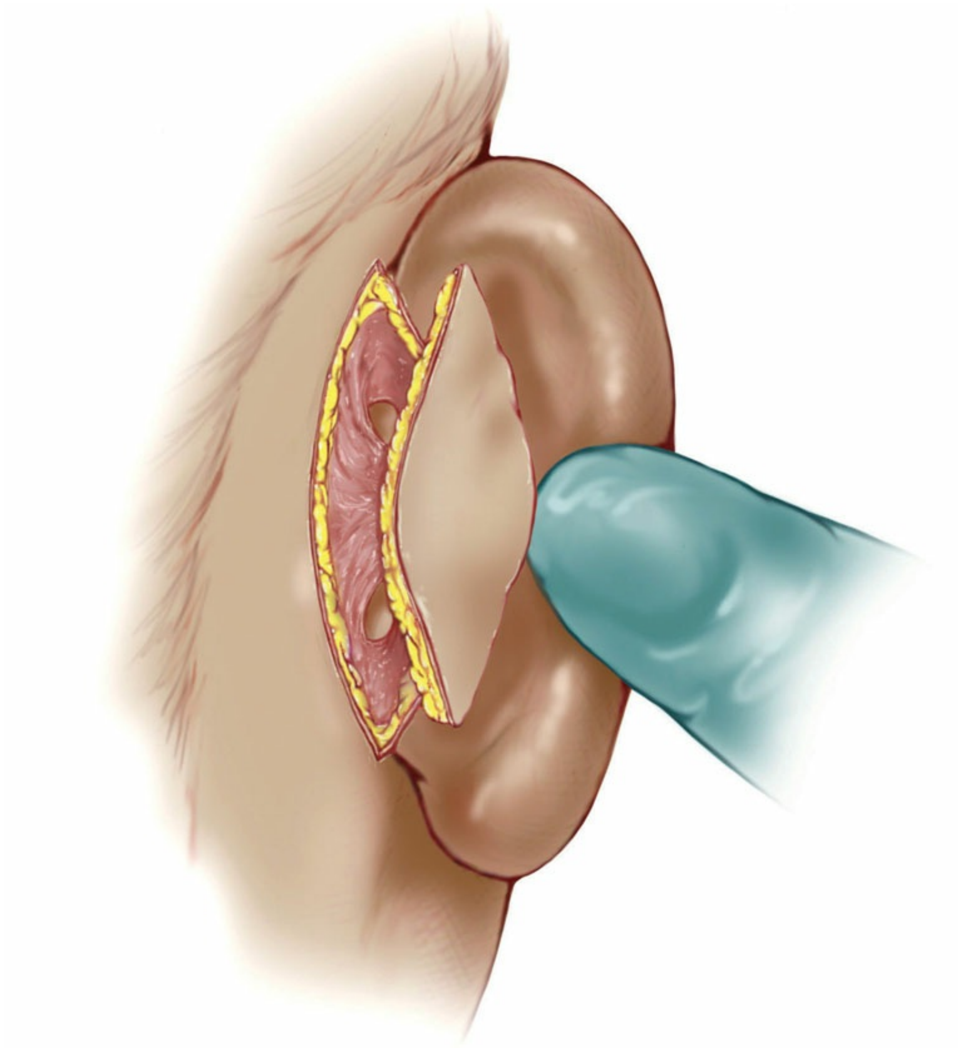


Figure 7.5C. Design of the postauricular pull-through flap. As there is no cutaneous connection, the flap functions as an island flap. The blood supply is random and is based on branches of the postauricular artery within the subcutaneous pedicle.

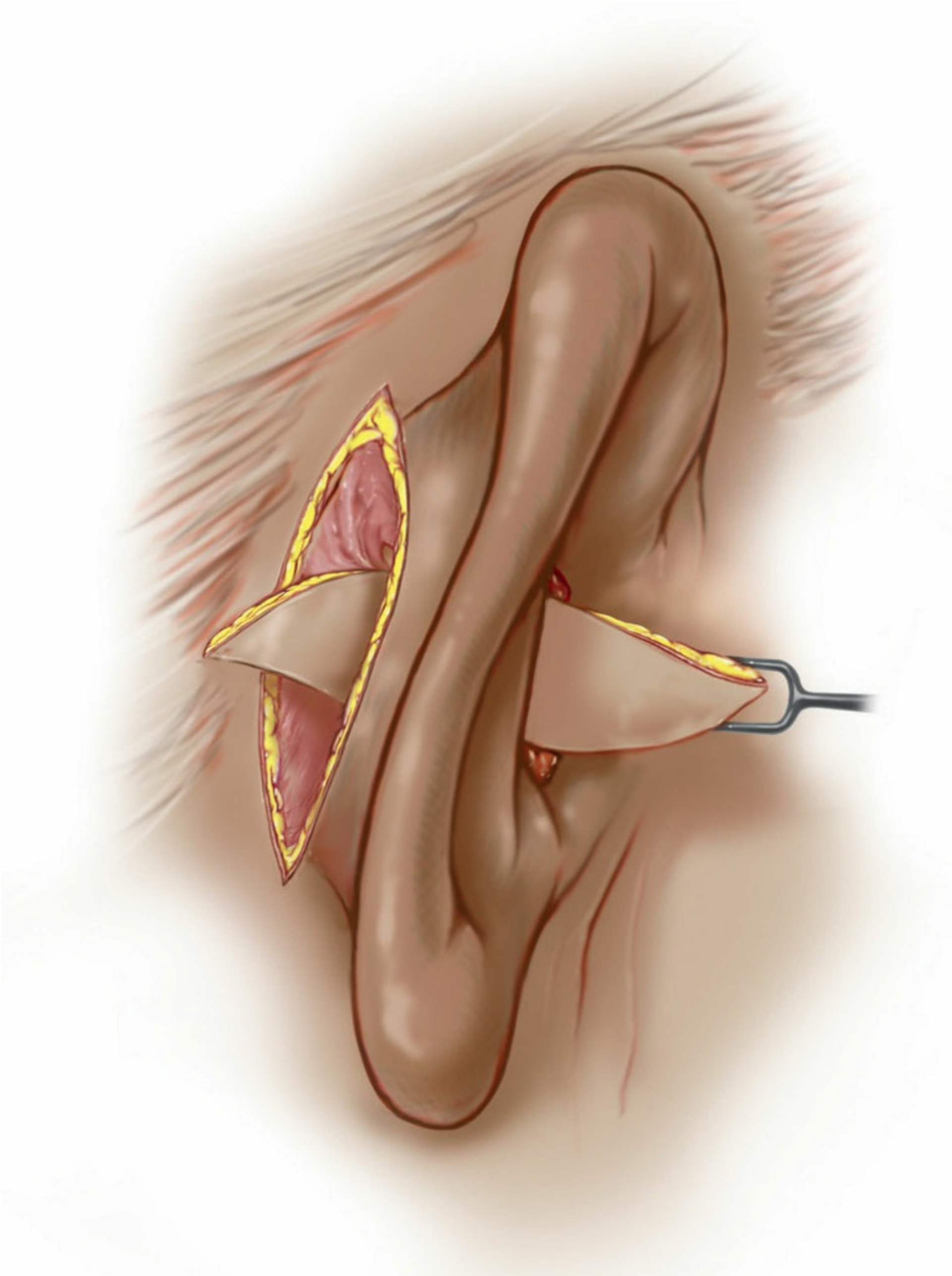


Figure 7.5D. After incision of the elliptical flap and careful dissection and preservation of the pedicle, the flap is passed through the surgical defect. The balance is between adequate mobilization of the flap and preservation of the vascular pedicle. Once the flap is properly mobilized and secured in place with one or two sutures, the secondary defect can be closed and final suturing of the flap may be completed.

Figure 7.5E. Postauricular pull-through flap sutured into place.

Figure 7.5F. Final healed result.

A second example of this repair is seen in a surgical defect on the triangular fossa and antihelix, which also involved cartilage (**Fig. 7.5G**). A similar approach is used, although the flap may have to be slightly off center from the postauricular sulcus or the pedicle may have to be located more to one end of the elliptical flap, to permit adequate reach (**Figs. 7.5H–J**).

Figure 7.5G. Surgical defect of the triangular fossa and antihelix includes loss of cartilage. As the defect base was adjacent to the postauricular sulcus, it was relatively easy to design a pull-through flap repair, which provided a well-vascularized flap for reconstruction.


Figure 7.5H. Appearance of postauricular pull-through flap sutured into place.

Figure 7.5I. Appearance of postauricular “donor” site of transposition flap immediately after surgery.

Figure 7.5J. Healed result of triangular fossa repair.

Key Points

- Defects that involve loss of cartilage might benefit from flap reconstruction to minimize scar contracture (in comparison to second intention healing or graft repair).
- A postauricular pull-through flap is a well-vascularized island flap, based on branches of the postauricular artery. The flap can provide excellent coverage for the conchal bowl or other locations on the

lateral pinna.

- Design is usually similar to the elliptical excision used for harvesting grafts from the postauricular sulcus except that a well-vascularized pedicle is maintained centrally.
- After adequate mobilization, the flap is passed through to the lateral aspect of the pinna and held in place with one or two sutures. Next, the secondary defect is closed in the postauricular sulcus, and finally, the flap is trimmed to fit the defect and sutured into place.

7.6 ANTIHELIX: FULL-THICKNESS SKIN GRAFT

For superficial defects that might distort free margins because of contraction associated with second intention healing, a full-thickness skin graft is a viable alternative (**Figs. 7.6A–C, G-I**). Possible donor sites include preauricular or pretragal cheek, postauricular sulcus, or postauricular neck. For larger defects, the supraclavicular area is a location where a large skin graft can be harvested (**Figs. 7.6D–F**). The grafts need to be appropriately thinned to increase the chance for the graft to survive or "take," and the perichondrium should be intact as a favorable wound bed is necessary. In areas where perichondrium is missing, fenestrations in the cartilage (e.g., 3 mm punch removal) can stimulate transcartilaginous migration of granulation tissue and facilitate graft survival. Compared to second intention healing, full-thickness skin grafts produce quicker time to final healing, less scar contracture, and, in some cases, improved cosmetic result. This final benefit, "improved cosmetic result," may be slightly controversial only because second intention healing works so well especially in concave areas (e.g., conchal bowl). Suffice it to say that skin grafts can provide excellent aesthetic results under the right circumstances.

Figure 7.6A. Moderate-sized defect on the helical sulcus and antihelix following skin cancer surgery.

Figure 7.6B. Full-thickness skin graft sutured into place with 5-0, fast-absorbing gut running percutaneous suture and tacking suture. Several polypropylene sutures around the periphery are to be used for a tie-down dressing. Donor site of the graft is the ipsilateral postauricular sulcus.

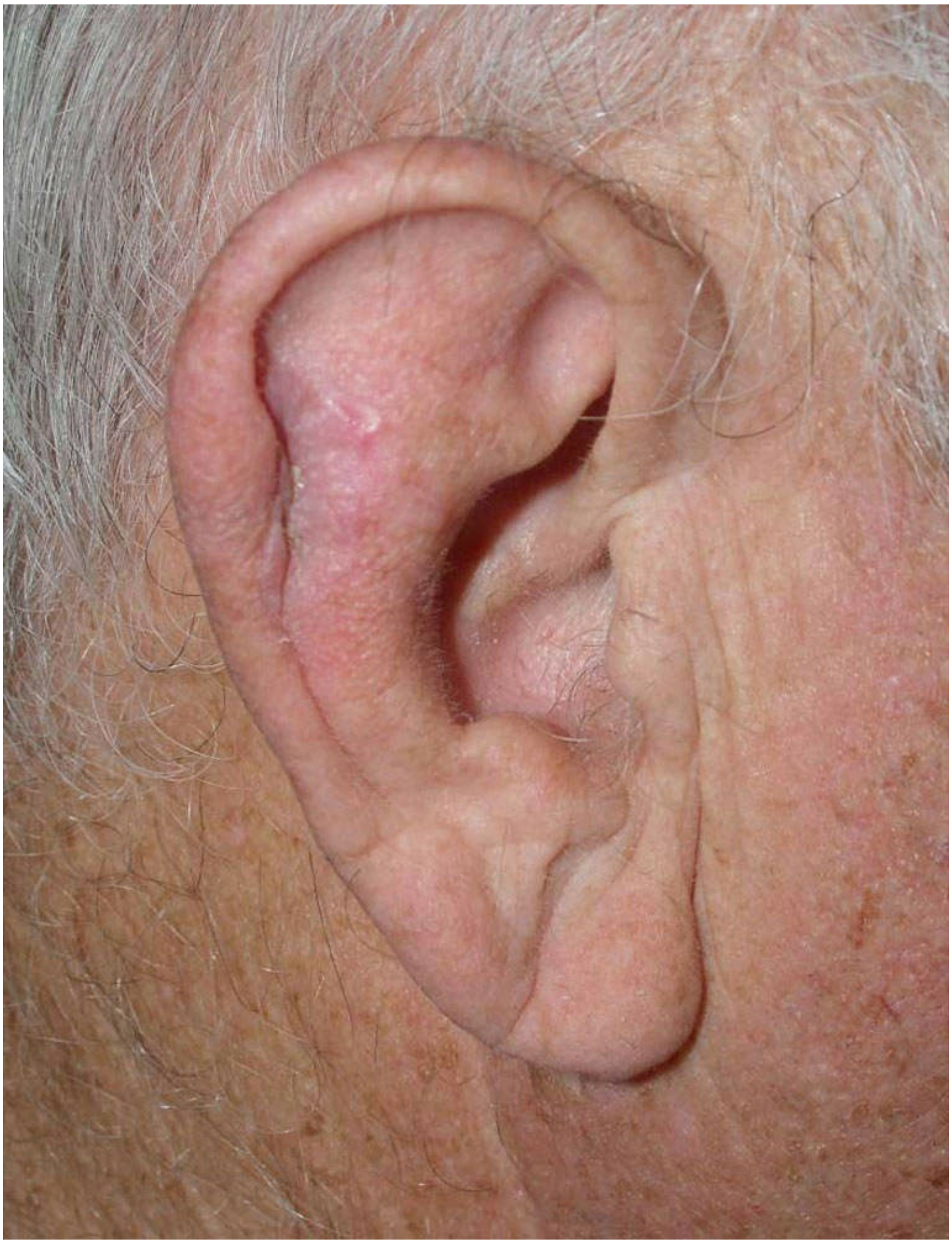


Figure 7.6C. Final healed result.

Figure 7.6D. Surgical defect involves the scaphoid fossa, antihelix, helical sulcus, and helical rim.

Figure 7.6E. Reconstruction with a full-thickness skin graft taken from the supraclavicular area. Tacking sutures help approximate skin graft to wound bed, especially in concave areas such as the helical sulcus. Tie-down dressing also helps hold graft into place, increasing graft “take” or survival.

Figure 7.6F. Short-term healed result. Although a graft only reconstructs surface and cannot reconstruct depth (e.g., thickness of helical rim), it can provide an acceptable result in specific circumstances.

Figure 7.6G. Surgical defect on the antitragus of the right ear.

Figure 7.6H. Full-thickness skin graft harvested from the preauricular cheek with donor site closure in the pretragal crease. Graft is sutured into place with 5-0, fast-absorbing gut running percutaneous suture. Several fenestrations are made within the graft to prevent accumulation of blood or serum between graft and wound bed. Several 5-0 polypropylene sutures are placed around the graft bed to be used for a tie-down dressing, which is usually removed 7 days later.

Figure 7.6I. Short-term healed result. Both the cosmetic result of graft recipient site as well as the donor site (pretragal crease) appear excellent. Mild pinkness will continue to fade.

Key Points

- A full-thickness skin graft from the pre- or postauricular skin or supraclavicular area can produce quicker healing and less scar contracture than second intention healing.
- The graft should be thinned with dissecting or tenotomy scissors,

removing all fat and subcutaneous tissue to improve graft survival.

- Tacking sutures help to approximate the graft to the wound bed, and may be used alone or in combination with a tie-down dressing to help to increase graft survival.

7.7 HELICAL RIM: HELICAL RIM ADVANCEMENT FLAP

Properly designed and executed, the helical rim advancement flap is a wonderful addition to a surgeon's repertoire for reconstruction of helical rim defects (**Fig. 7.7A and 7.7I-U**).

From the author's experience, there are two aspects of the design that may vary among surgeons or literary sources. Unfortunately, some of these variations make the flap more difficult to perform or jeopardize the viability of the flap. The first of these variations is having the flap extend only to the inferior aspect of the helical rim, i.e., stopping short of the lobule. The second design variation is making the flap a full-thickness incision, essentially advancing a tube of helical rim to fill the defect. Regarding the first aspect, the lion's share of loose or lax tissue from where to borrow is in the lobule of the ear. Ending the flap along the helical rim really only stretches the helical rim. Extending the flap to the lobule and removing a tricone within the lobule allows one to advance the flap significantly. The second design variation involves a full-thickness incision through the helical sulcus to the medial or posterior aspect of the ear. The problem with this approach is that it significantly decreases the available blood supply to the flap. Rather than keeping the skin on the medial pinna intact and benefitting from the broad pedicle of the flap, the pedicle (and therefore the blood supply) of the flap is significantly reduced, jeopardizing the viability of the distal portion of the flap.

Figure 7.7A. This 50-year-old man was left with a 1.4 × 1.2 cm defect on the left helical rim following Mohs surgery for a squamous cell carcinoma.

The properly designed and executed helical rim advancement flap should have an incision that extends all the way to the lobule, where a tricone is excised (**Fig. 7.7B**). The flap should have a broad-based pedicle, essentially preserving all of the skin on the medial aspect of the pinna except for a tricone, which is excised near the end of the repair (**Fig. 7.7C**). To mobilize the flap, the skin on the medial pinna needs to be undermined completely to the postauricular sulcus, but maintaining a broad pedicle for the flap helps preserve a robust blood supply. After adequately undermining, the flap is advanced into the surgical defect and

the helical rim is sutured into place with one or two 4-0 absorbable, buried vertical mattress sutures. The wound edges over the helical rim are approximated and hypereverted by two or three 5-0 polypropylene vertical mattress sutures, and the remainder of the wound is closed with a running percutaneous polypropylene suture (**Fig. 7.7D**). A small tricone is excised on the medial aspect of the pinna and repaired. The final healed result shows a good cosmetic outcome (**Fig. 7.7E**).

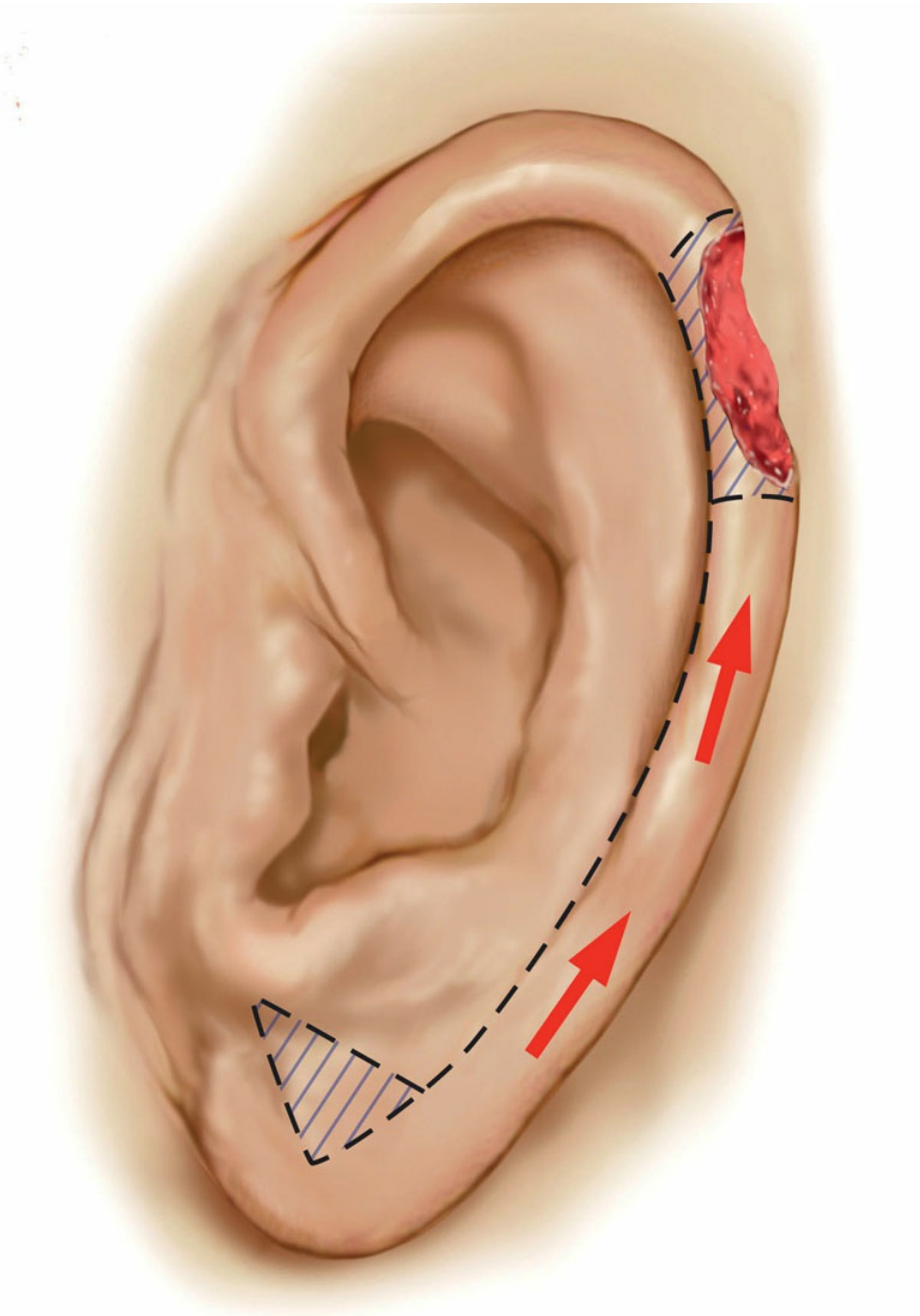


Figure 7.7B. Proper design of the helical rim advancement flap. The surgical defect is slightly enlarged so that the repair is completed at the junctions of cosmetic units (e.g., within helical sulcus) and so that the advancing flap and

closure is perpendicular to the skin surface. The incision along the helical sulcus is carried to the lobule, where a tricone is excised to facilitate advancement of the flap after undermining on the medial pinna. Incisions through the helical sulcus and lobule are carried to the medial aspect of the pinna but do not incise the cutaneous surface on that side.

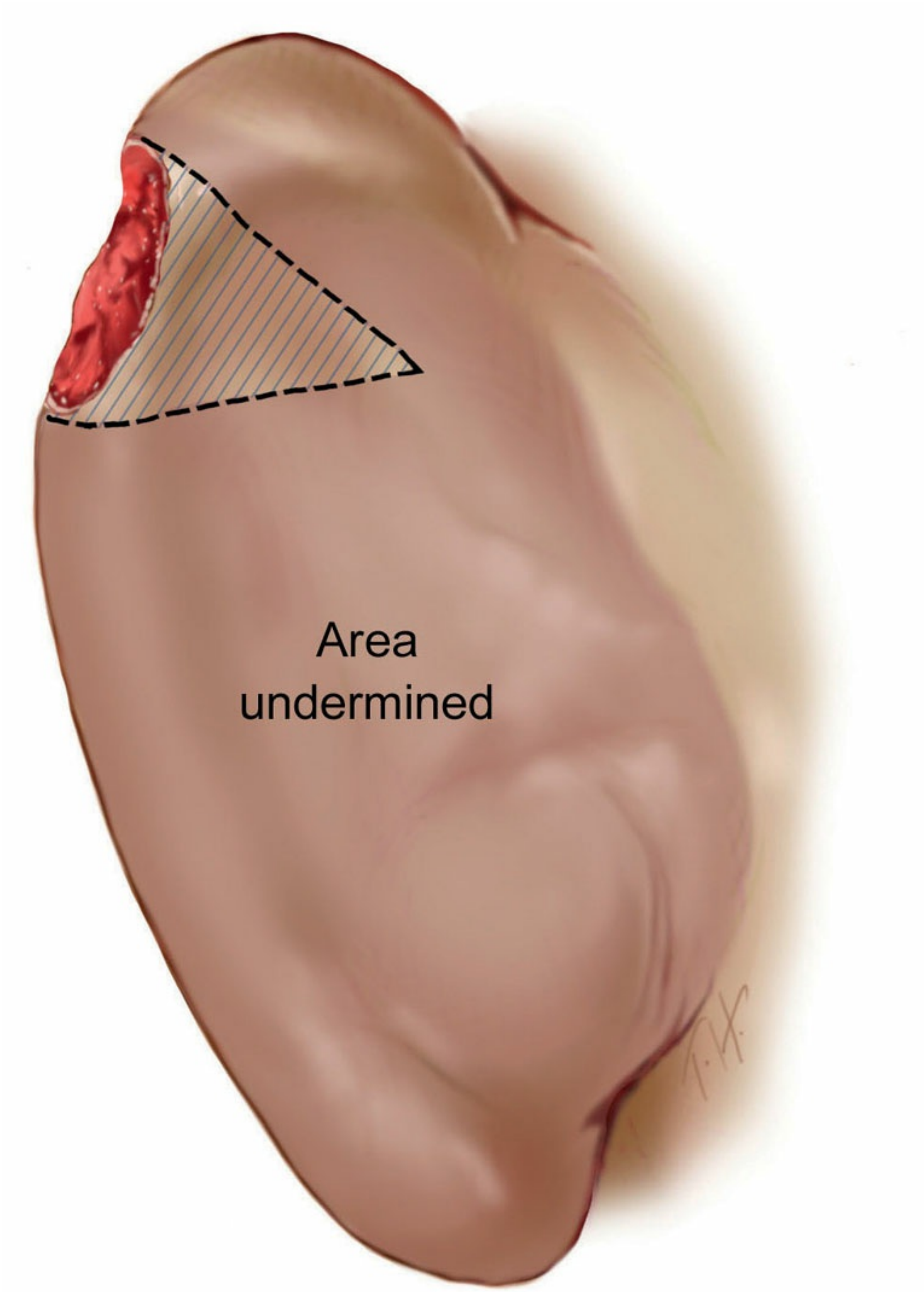


Figure 7.7C. Medial aspect of the pinna. Undermining is completed over the medial pinna all the way to the postauricular sulcus, but except for excision of the tricone, the skin is not incised. Maintaining a broad pedicle preserves the vascular supply to the flap.

Figure 7.7D. Helical rim advancement flap sutured into place. One or buried vertical mattress sutures at the leading edge of the flap secure the flap in place. Over the helical rim incision, vertical mattress sutures are used to approximate and hyperevert the rim (to avoid notching after healing). A running suture is used along the helical sulcus and lobule and on the excision of the tricone on the medial aspect of the pinna.

Figure 7.7E. Final healed result. Helical rim is well reconstructed. Lobule is slightly smaller in height.

The second example is a relatively larger surgical defect, but by following the same principles and continuing the incision to the lobule, an adequate amount of tissue was recruited for repair (**Figs. 7.7F–H**). How large a surgical defect can be repaired in this manner is based on a number of factors. Older patients with larger ear lobules can obviously provide a larger resource for reconstruction, but even in younger patients, a defect measuring up to 1.5 or even 2.0 cm can be repaired with a helical rim advancement flap.

Figure 7.7F. This 56-year-old woman was left with a 2.3 × 1.2 cm defect along the helical rim following Mohs surgery for a basal cell carcinoma.

Figure 7.7G. A helical rim advancement flap reconstructed the surgical defect. The incision over the helical rim was closed with 4-0 absorbable, buried vertical mattress sutures and 5-0 polypropylene vertical mattress sutures to approximate and hyperevert the wound edges.

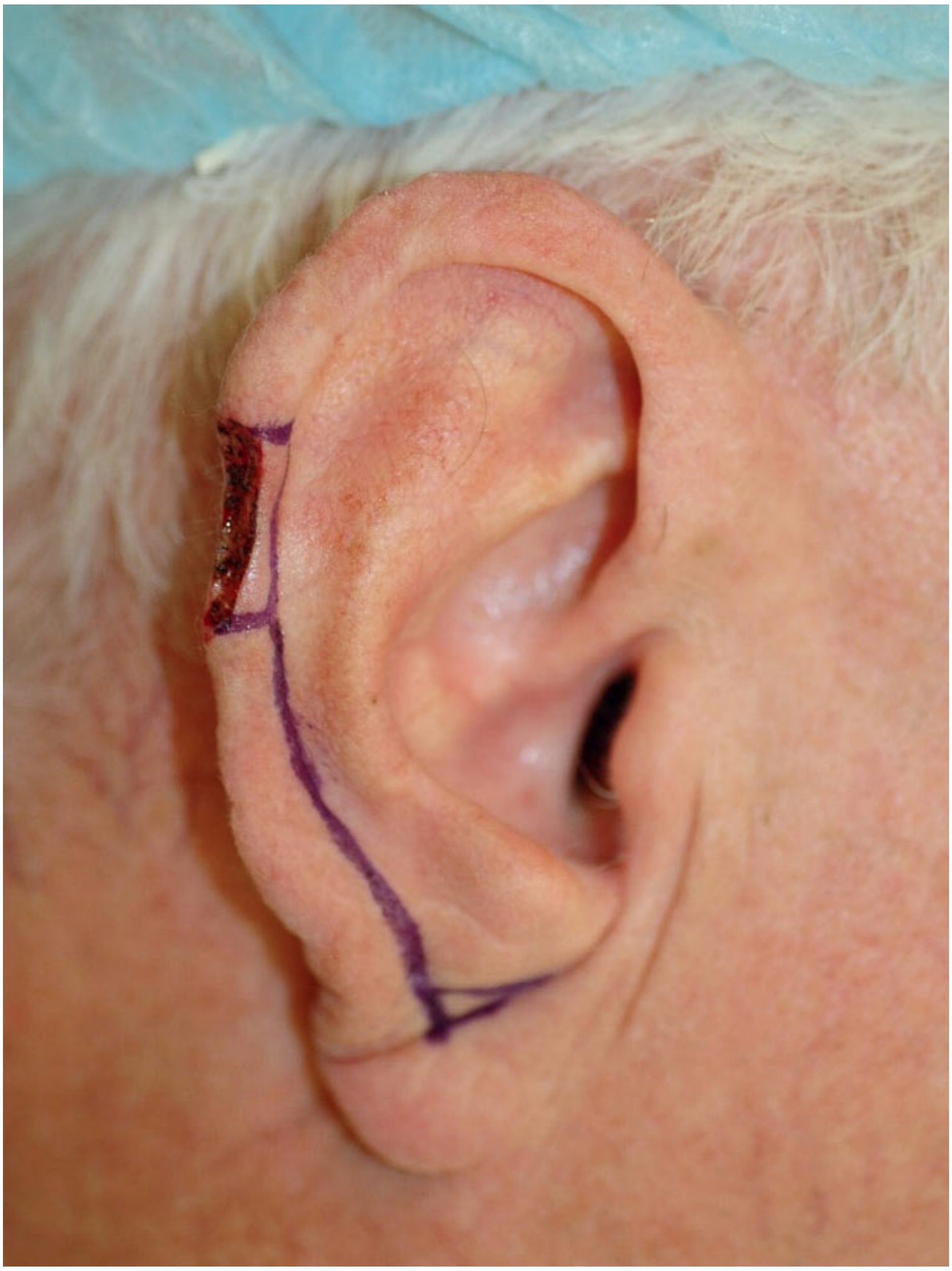
Figure 7.7H. Final healed result. Lobule slightly smaller in height but with a good shape and unbroken helical rim. Lobule can be repierced after 3 months.

Key Points

- Helical rim advancement flaps are a useful repair for small- to medium-sized defects of the helical rim.
- Incision within the helical sulcus should be carried to the lobule, but the incision should keep the skin on the medial pinna intact (i.e., a broad flap pedicle should be maintained on the medial pinna).

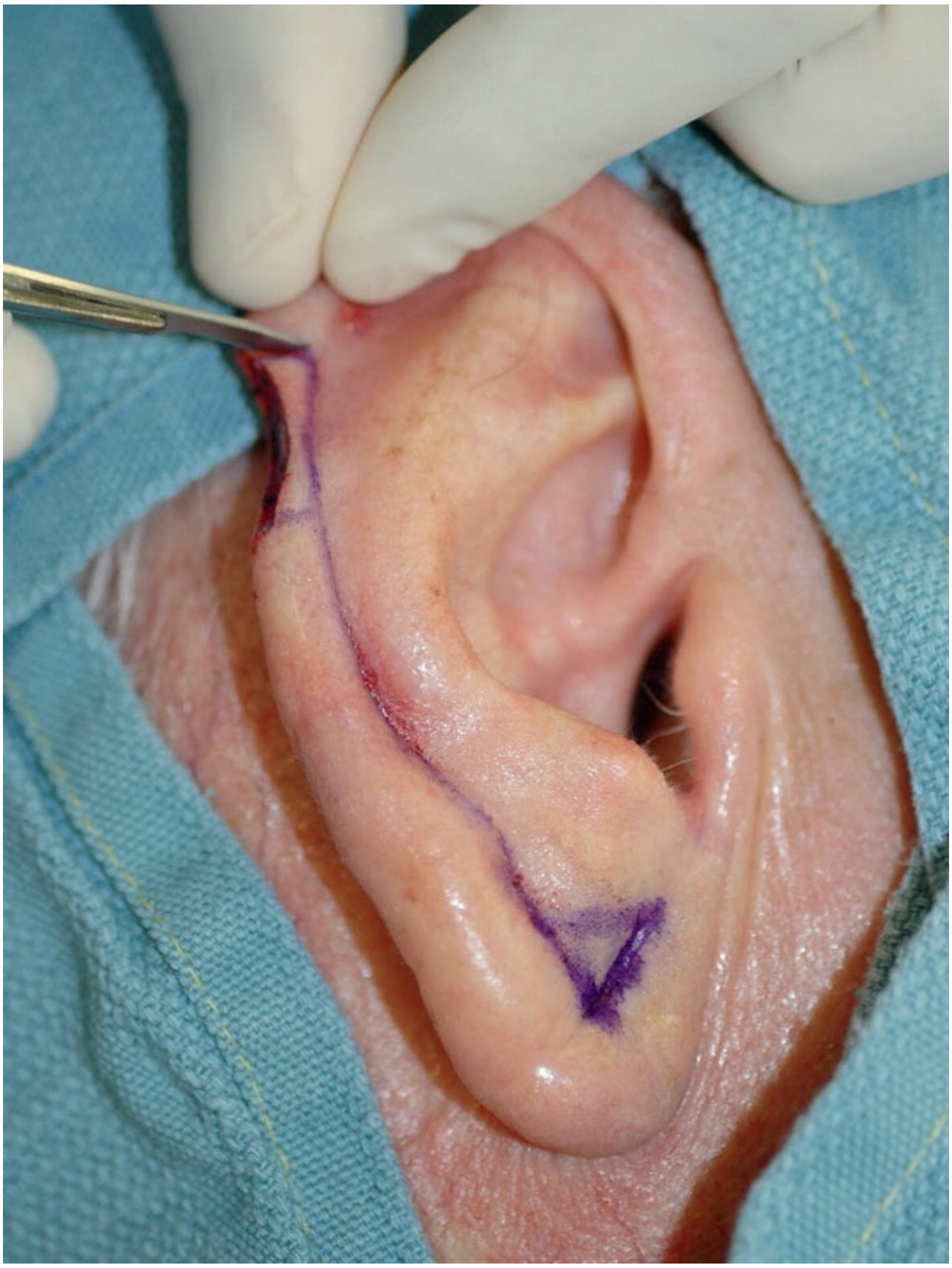
- A tricone excision in the lobule facilitates advancement of the flap.
- As with other closures crossing the helical rim (e.g., wedge excision repair or staged postauricular repair), closure of the epidermis over the helical rim should be with vertical mattress sutures to hyperevert the skin edges and avoid notching of the rim.

STEP-BY-STEP HELICAL RIM ADVANCEMENT FLAP



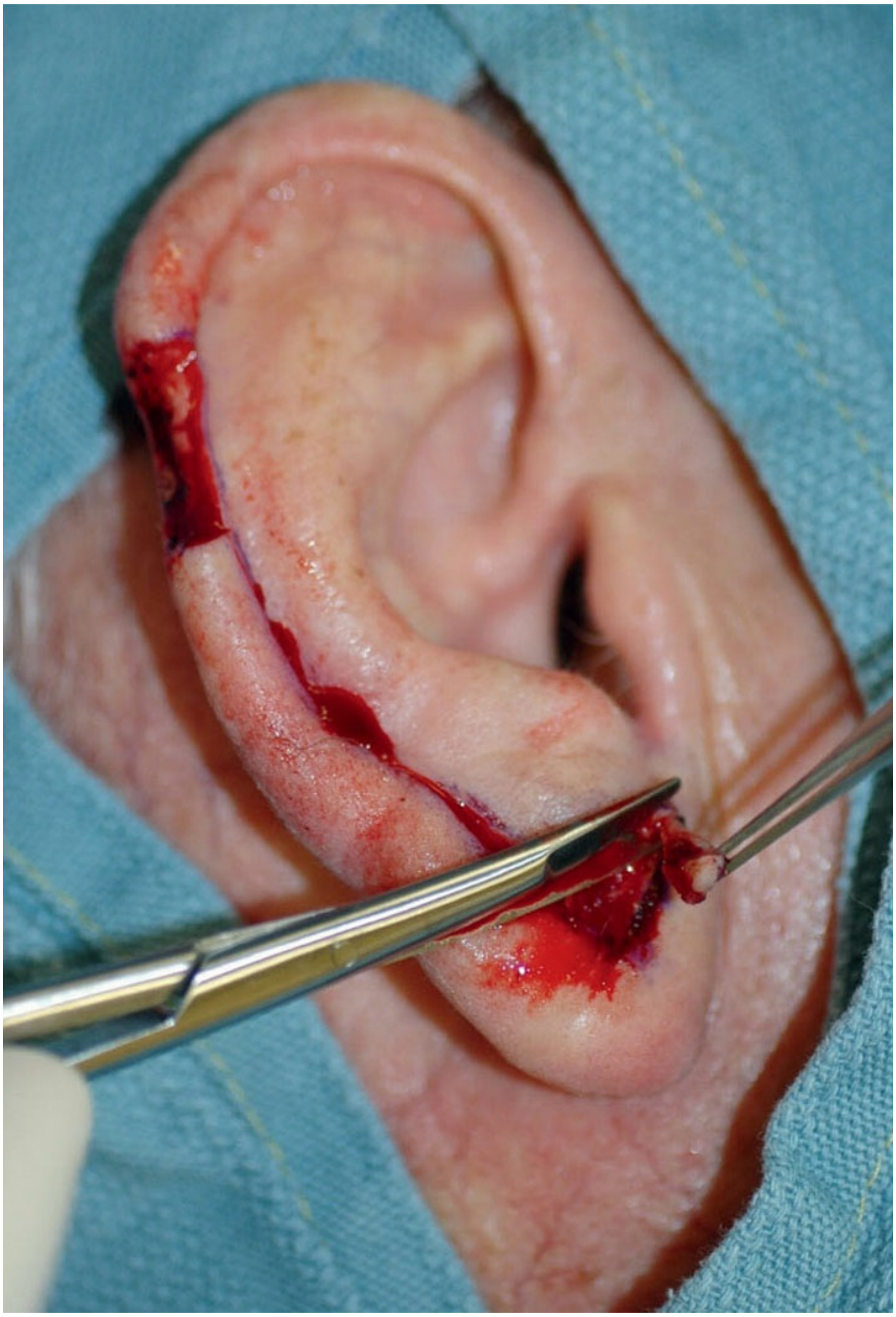
►**Figure 7.7I.** Surgical defect on the helical rim to be repaired by helical rim advancement flap. The edges of the defect will be made perpendicular to the skin surface. The flap is marked out with a long incision following the helical sulcus to the lobule, where a tricone will be excised to facilitate advancement of the flap into the defect.

►**Figure 7.7J.** Local anesthesia is infiltrated along the helical sulcus to the lobule and also along the helical rim and over the medial (i.e., posterior) aspect of the pinna to the postauricular sulcus.

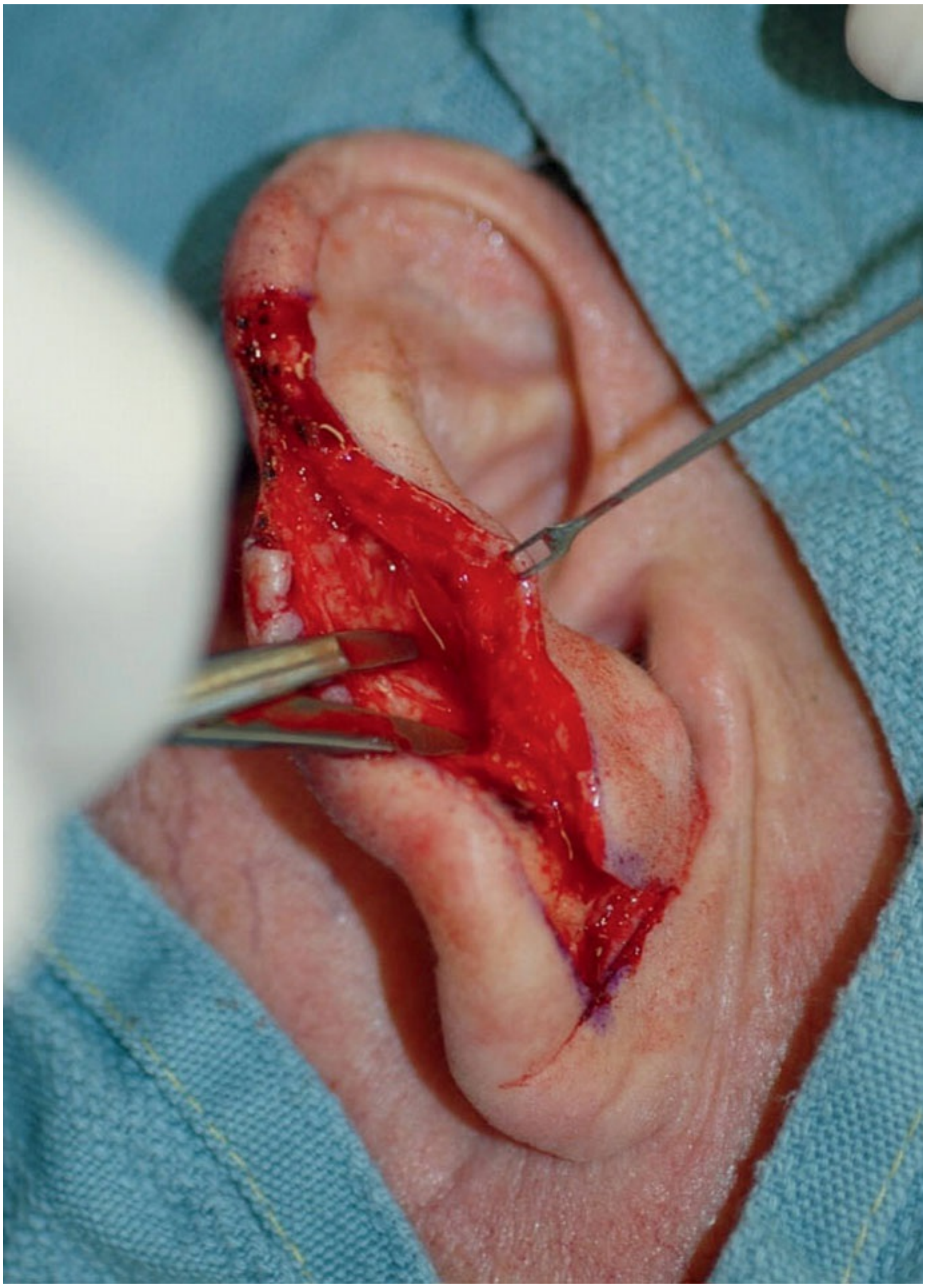


►**Figure 7.7K.** Edges of the surgical wound are made perpendicular to the skin surface to better approximate wound edges when the flap is advanced into the surgical wound.

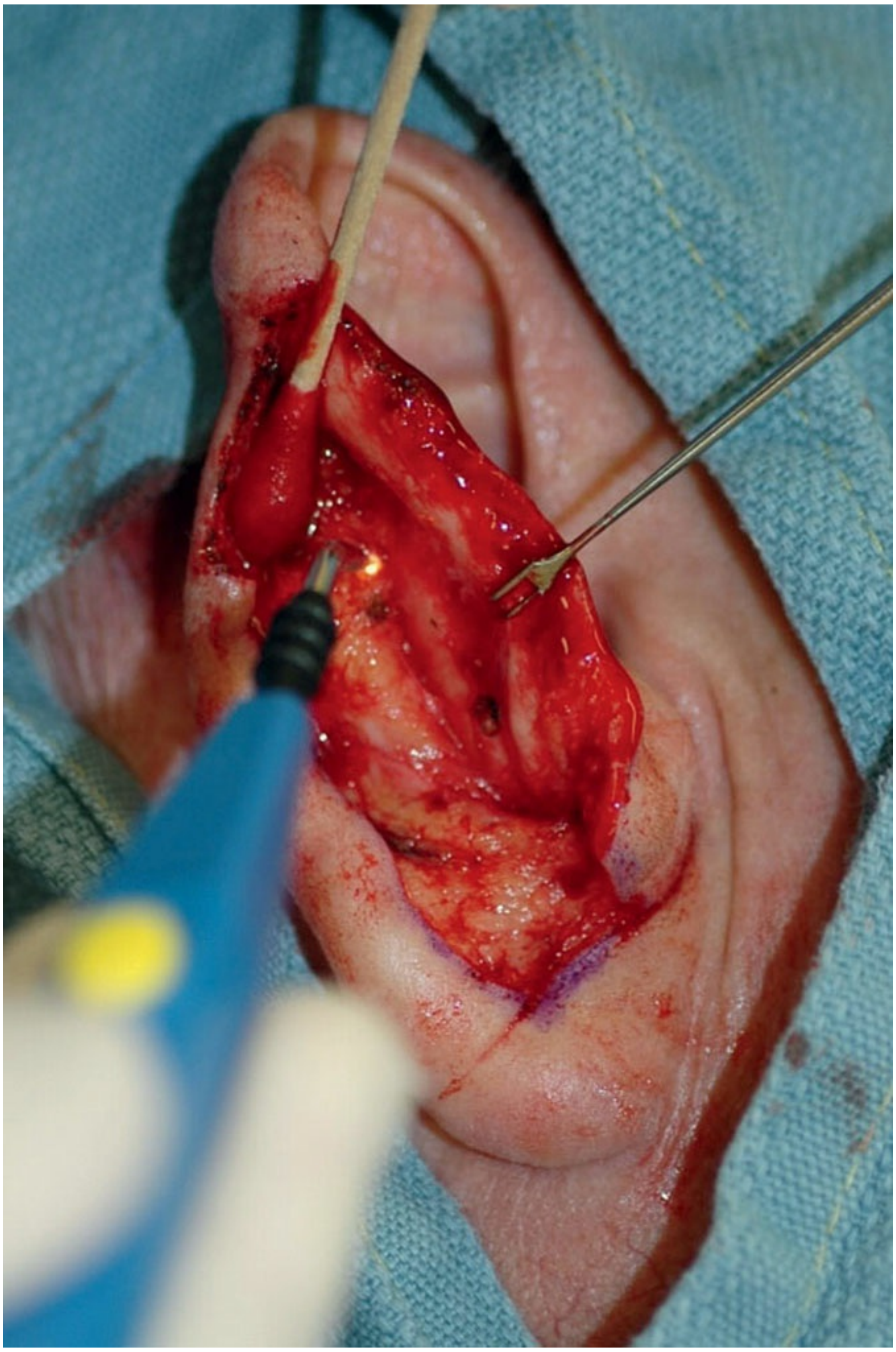
►**Figure 7.7L.** Incision is made along the helical sulcus but keeps the skin on the medial aspect of the pinna intact.



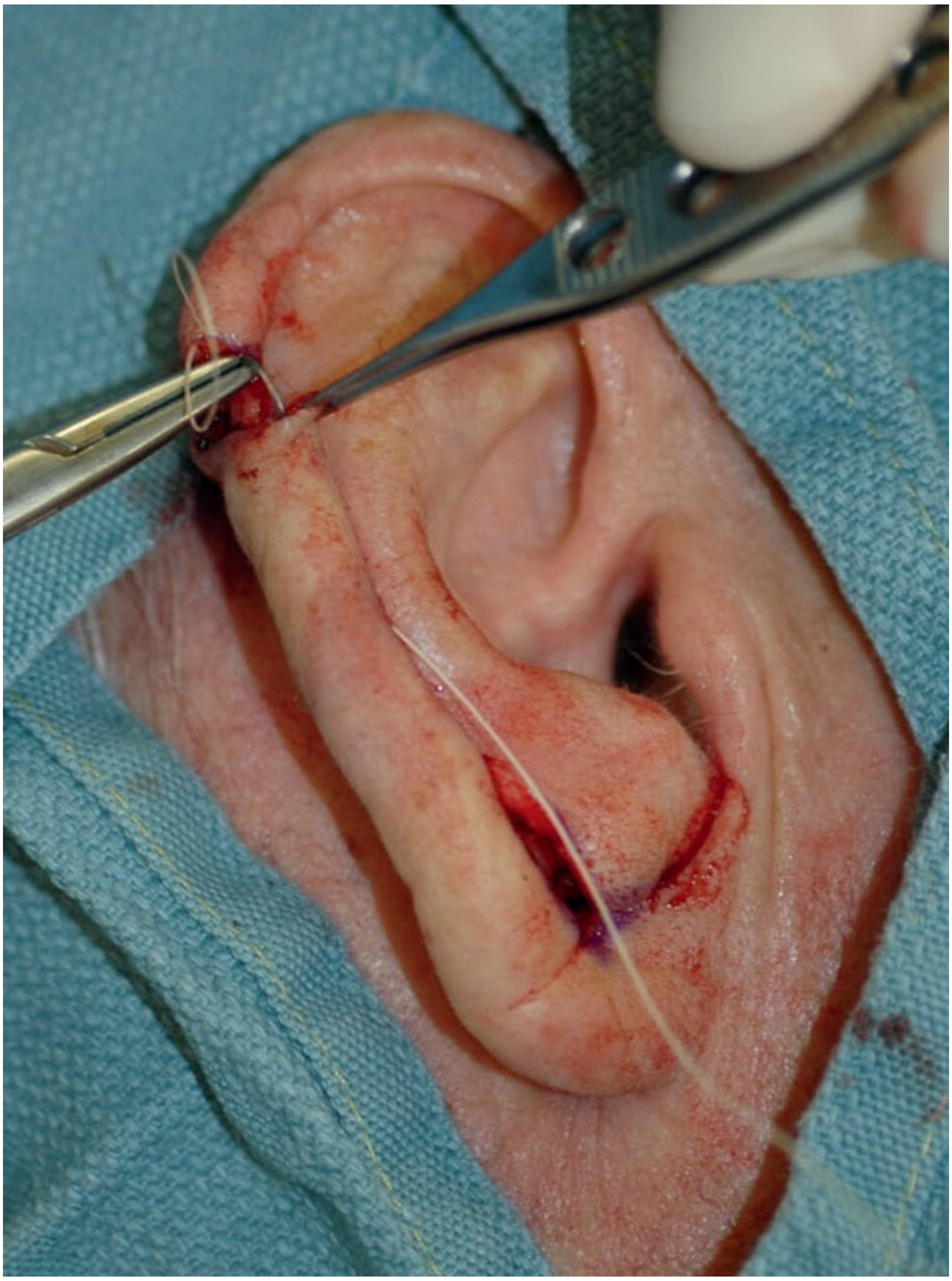
►**Figure 7.7M.** Tricone is excised at the distal aspect of the incision within the lobule, which will allow the flap to advance more easily.



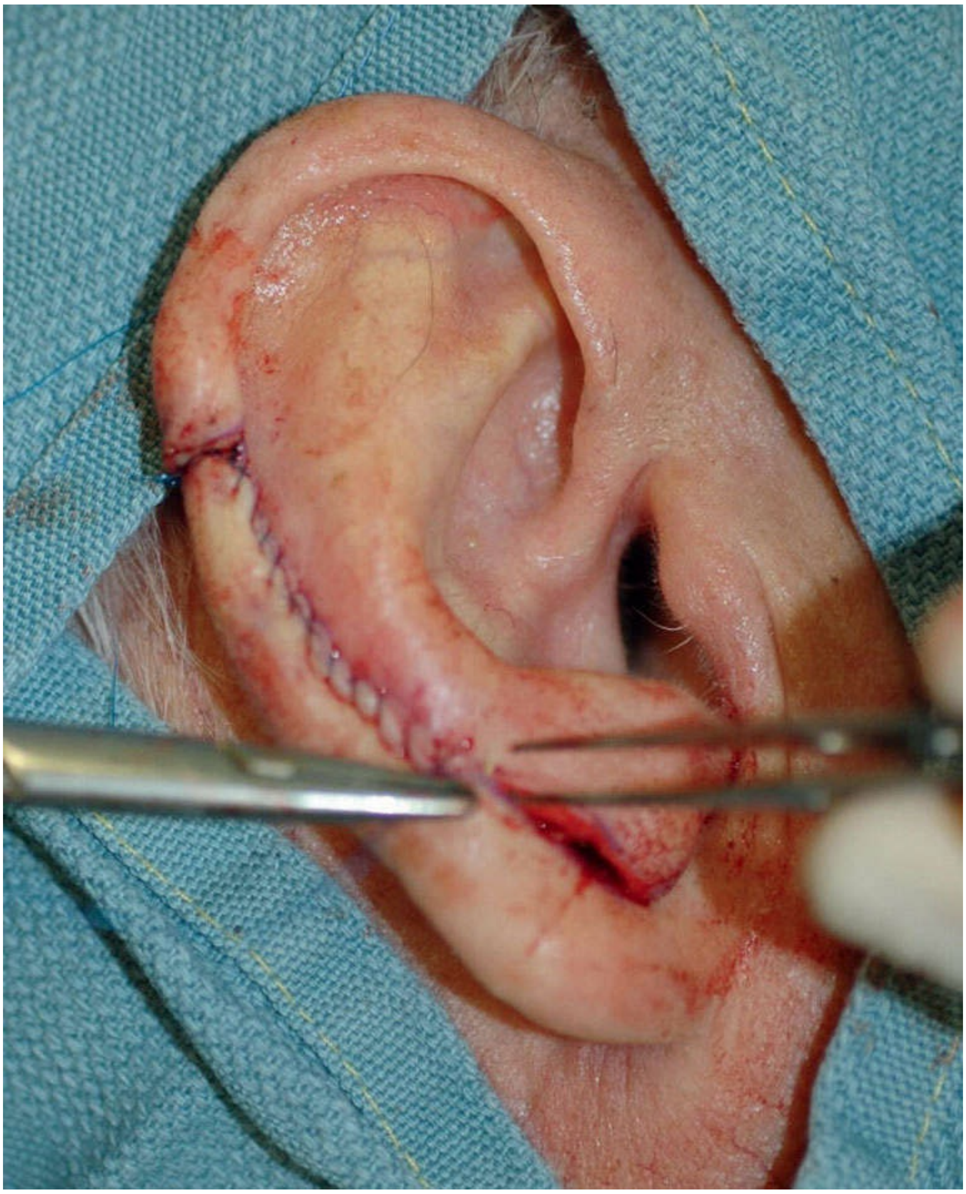
►**Figure 7.7N.** Skin hook is used to reflect the pinna outward, and the broad pedicle of the flap on the medial aspect of the pinna is undermined widely by blunt dissection, freeing the skin completely from the medial pinna. Undermining is carried to the postauricular sulcus.



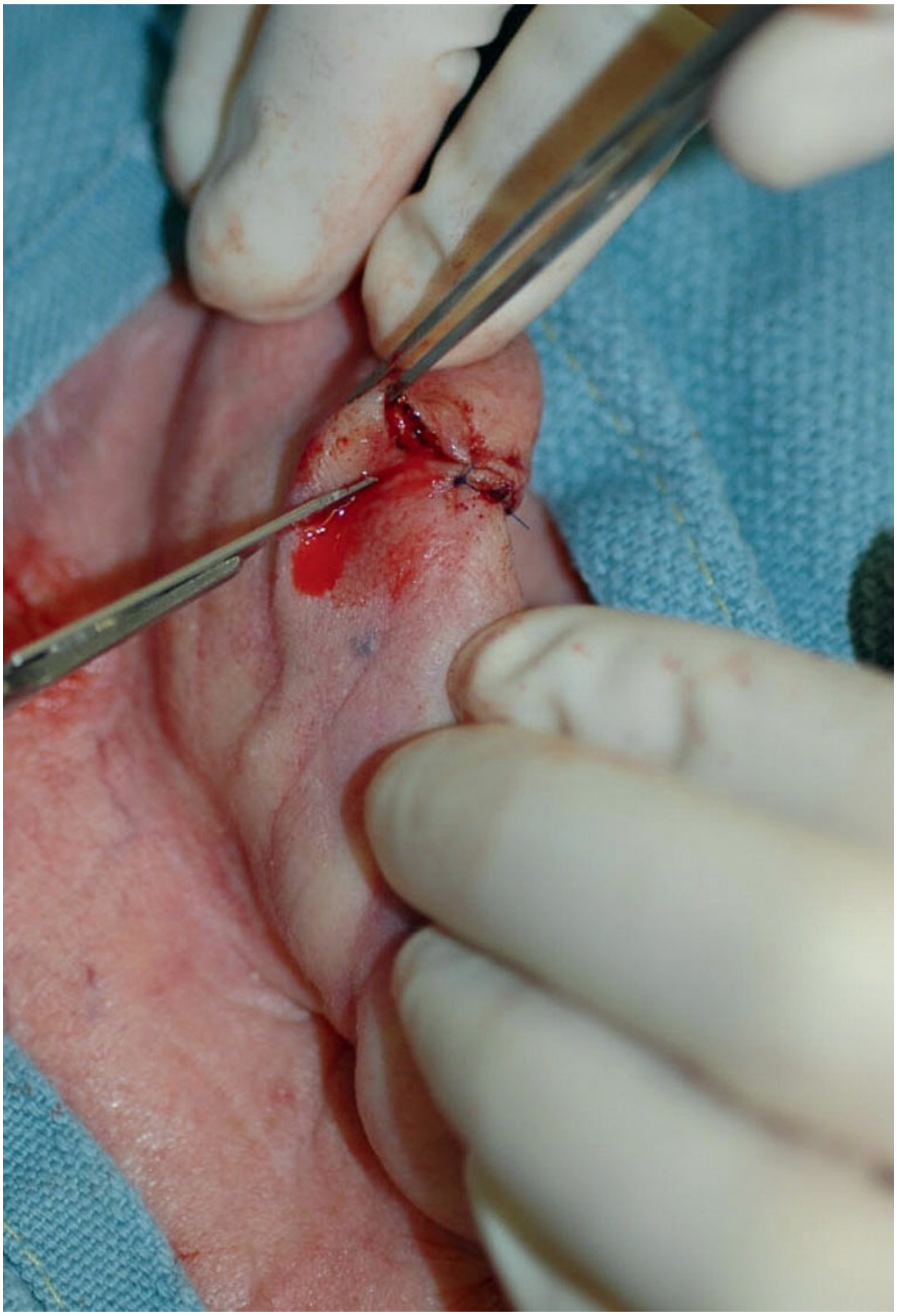
▶ **Figure 7.7O.** Light spot electrodessication is used for hemostasis.



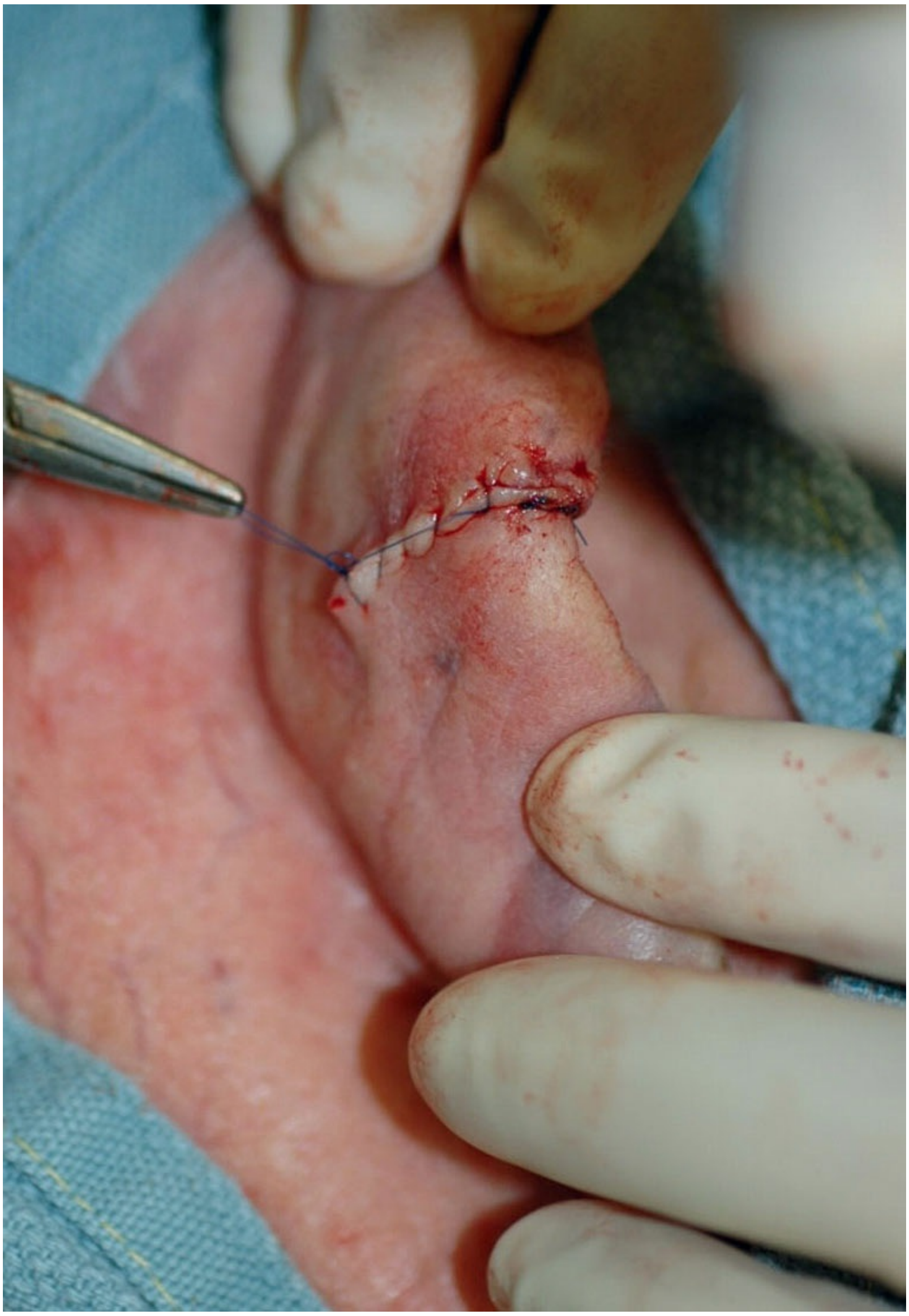
►**Figure 7.7P.** Flap is advanced into the surgical wound and sutured into place with 4-0 polyglactin 910 buried vertical mattress sutures. Additional buried, absorbable sutures may be used along the helical sulcus and lobule to secure the flap in place.



►**Figure 7.7Q.** Vertical mattress (e.g., 5-0 polypropylene) sutures are used across the helical rim to hyperevert the helical rim and decrease chance of contracture and notching at the helical rim. Along the helical sulcus and lobule, a running percutaneous suture is used to approximate the skin edges.



►**Figure 7.7R.** Advancing the flap creates a standing cone or tricone on the medial surface of the pinna. This tricone is excised.



►**Figure 7.7S.** After excision of the tricone, the wound is closed with a running percutaneous suture.

►**Figure 7.7T.** Immediate postoperative appearance. Pressure bandage is applied for 24 hours to decrease swelling, pain, and risk of bleeding. Sutures are removed at 7 to 10 days.

►**Figure 7.7U.** Short-term healed appearance. Helical rim is well approximated without notching. Incision along helical sulcus and lobule is well hidden, and shape and continuity of pinna and helical rim are excellent.

7.8 HELICAL RIM: WEDGE EXCISION REPAIR

For small- to medium-sized helical rim defects that extend onto the outer pinna (in this case onto the scaphoid fossa), a wedge excision repair may provide an excellent alternative for ear reconstruction (**Fig. 7.8A**). A simple wedge-shaped excision may work well, but a star-shaped or modified wedge helps to minimize cupping or buckling of the ear. Excision of cartilage will decrease the size of the ear; so this type of repair

is suitable only for small or medium defects. After the full-thickness wedge or modified wedge is excised, the cartilage is closed with several buried, absorbable sutures, having an assistant approximate the cartilage edges while tying suture to avoid cutting through the cartilage with the suture material. The knots on these buried sutures should be on the medial side of the pinna as the skin is looser and less bound to the cartilage, decreasing the chance of suture extrusion (as opposed to knots on the lateral aspect of the pinna). The epidermis is closed with a nonabsorbable suture, and the helical rim is hypereverted with vertical mattress sutures to decrease the chance of notching (**Figs. 7.8B and C**).

Figure 7.8A. Surgical defect on the right helical rim and pinna following Mohs

surgery for a lentigo maligna melanoma in a 48-year-old man.

Figure 7.8B. Modified wedge excision repair of the ear. Two tricones on the pinna are incorporated into the design to prevent buckling or cupping of the ear upon closure.

Figure 7.8C. Final healed result shows some slight notching on the helical rim.

Key Points

- Wedge excision or modified wedge excision repair decreases the size of the ear and may cause cupping, and therefore is useful only for small- to medium-sized defects.
- Help of a surgical assistant is needed to approximate cartilage edges so that the suture does not cut through the cartilage while securing.
- Knots on the buried sutures through the cartilage should be on the medial side of the pinna as the skin is looser and less bound down

and the chance of subsequent suture extrusion is less.

7.9 HELICAL RIM: STAGED POSTAURICULAR TRANSPOSITION FLAP

For larger defects involving the helical rim, a staged postauricular transposition flap may provide a good aesthetic and functional result. A full-thickness skin graft will not adequately reconstruct the framework of the helical rim, and the postauricular sulcus and postauricular scalp are good sites from which to borrow tissue and hide scars.

In the first example, the defect involves a large segment of the midhelical rim and extends well onto the medial and lateral aspects of the pinna (**Figs. 7.9A and B**). A staged postauricular transposition flap was designed, advancing the flap to the leading edge of the defect (**Fig. 7.9C**). In cases where the flap will not completely cover the defect, the staged postauricular transposition flap can be used to reconstruct the helical rim, and the lateral (i.e., anterior) pinna can be repaired with a graft (see Section 7.6) or second intention healing (see Section 7.4). (Note: The helical rim defect in this case is broad and deep and extends onto the medial pinna [requiring flap repair], whereas the one in the example in Section 7.6 is superficial and just extends to involve the helical rim [permitting graft repair].) The width of the postauricular flap (i.e., superior–inferior dimension) should be equal to or slightly greater than the width of the helical rim defect. In this case, it is slightly wider as the defect on the lateral pinna extends superiorly toward the scaphoid fossa and thus is wider than the helical rim defect. The flap is sutured into place on the lateral pinna. Vertical mattress sutures are used around the helical rim to hyperevert the wound edges and decrease the chance of notching on the rim. The pedicle is exposed, and a bismuth- and petrolatum-impregnated gauze is sutured carefully to the open pedicle to help keep it moist and minimize postoperative bleeding. Three to four weeks later, the pedicle is divided at its base on the non-hair-bearing border of the postauricular scalp (**Fig. 7.9D**). The flap is thinned and wrapped around to the medial pinna, helping to cover the remaining defect on this area. At this time, the pedicle may be thinned of excessive soft tissue and the medial pinna defect may be freshened (e.g., curettage of excessive granulation tissue and incision of wound edges perpendicular to the skin surface) to allow suturing of the remaining flap into the surgical defect. The residual defect on the

postauricular scalp is allowed to heal by second intention healing or may be grafted. In the healed view, there is slight excessive bulk to the flap (**Fig. 7.9E**). A procedure could be performed to thin out the flap (perhaps an access incision within the helical sulcus); however, the patient was very satisfied with the final result and no further surgery was performed.

Figure 7.9A. Surgical defect on the left ear involves much of the helical rim and antihelix.

Figure 7.9B. Defect extends onto the medial pinna to the postauricular sulcus.

Figure 7.9C. Staged postauricular transposition flap sutured into place.

Figure 7.9D. Three to four weeks later, the pedicle is divided, thinned, and enveloped around the helical rim. The remaining defect on the postauricular sulcus is allowed to heal by second intention healing.

Figure 7.9E. Final healed result.

The second example is a surgical defect with greater structural loss as the defect involves sacrifice of the scaphoid fossa cartilage and lateral skin as well as helical rim and antihelix (**Fig. 7.9F**). The medial aspect of the pinna beneath the scaphoid fossa is preserved, promoting the likelihood of cartilage graft survival in this area. Additional structural support is necessary in this repair to provide a reliable framework for the residual native helical rim as well as the skin and soft tissue being transposed in the staged postauricular transposition flap. A slightly concave portion of the

conchal bowl served as donor site of the cartilage graft for the scaphoid fossa, with the graft sutured to the residual native cartilage and soft tissue with 4-0 polyglactin 910 sutures. The postauricular transposition flap was secured with absorbable and nonabsorbable sutures with bismuth/petrolatum-impregnated gauze sutured to the open pedicle (**Fig. 7.9G**). By sandwiching the cartilage graft between two well-vascularized surfaces, the chance of complete graft survival and enhancement of the anterior–posterior dimension of the pinna is increased. Like the first example, at 3 to 4 weeks, the pedicle is divided close to the postauricular scalp. The pedicle is thinned to match the thickness of the ear; wound edges may be freshened and healing scars may be revised, and the flap is wrapped around to the medial pinna, recreating the helical rim (**Fig. 7.9H**).

Figure 7.9F. Surgical defect following excision of an aggressive nonmelanoma skin cancer with loss of helical rim and sulcus, antihelix and scaphoid fossa.

Figure 7.9G. For structural reconstruction and to fill the scaphoid fossa defect, conchal cartilage was harvested, trimmed, and sutured to existing cartilage. To cover this and restore the skin and soft tissue of the antihelix and helical rim, a staged postauricular transposition flap was sutured into place. The bismuth- and petrolatum-impregnated gauze is carefully secured to the open portion of the pedicle to keep the pedicle moist and minimize risk of bleeding. Three to four weeks later, the pedicle is divided close to the scalp, and the flap and pedicle are thinned and draped around to the medial pinna to recreate the helical rim.

Figure 7.9H. Final healed result shows good shape and contour to the ear and good reconstruction of the helical rim.

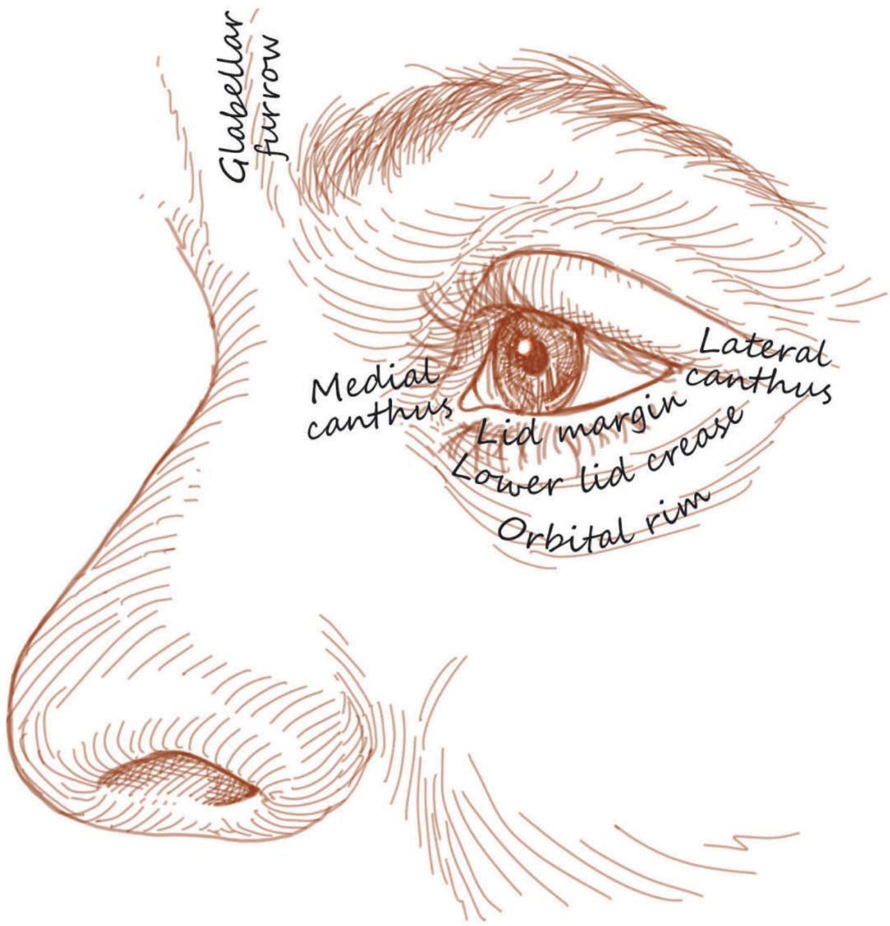
Key Points

- Larger defects involving the helical rim can be reconstructed with a staged postauricular transposition flap.
- The height of the flap should be equal or slightly greater than the height of the defect.
- Dissection of the flap on the medial pinna is above the perichondrium and from the postauricular sulcus onto the mastoid or postauricular

scalp dissection proceeds at a deeper plane just above the fascia.

- Excision of two tricones from the base of the pedicle and blunt/sharp dissection facilitate advancement of the flap.
- Portions of the defect can be repaired with grafts (e.g., antihelix) or allowed to heal by second intention healing (e.g., postauricular sulcus or scalp after division and inset of the pedicle).

8 Eyelid Reconstruction



As a focus of facial recognition and societal beauty, proper functional and aesthetic reconstruction around the eyes is of paramount importance. Functional goals include the maintenance and protection of globe function, and preservation of the lacrimal system and a moist and lubricated environment for the cornea. Aesthetic objectives include preservation of the symmetry, shape, and size of the eyes and periocular structures. As two paired, centrally located structures suspended by tendons medially and laterally and bounded by complex functioning free margins, eyelid reconstruction requires a thoughtful, stepwise approach for clinical success.

8.1 LOWER EYELID: SIDE-TO-SIDE REPAIR

Surgical defects on the lower eyelid may frequently be closed in a side-to-side fashion, but one must pay attention to the local topography and nearby free margins. There is a relative convexity over the lower eyelid skin adjacent to a relative concavity along the lower eyelid crease, which is adjacent to a relative convexity over the orbital rim. As a result, a longer length-to-width ratio (e.g., 4:1 or greater) may be necessary for side-to-side repair, or an S-plasty may be incorporated to permit closure without a persistent tricone or dog-ear at the poles of the incision. One good point that works well is to have the patient sit up and mark out the orbital rim and infraorbital crease on either side of the surgical defect. By proper alignment of these landmarks, the risk of ectropion is minimized. Tricones or dog-ears can be excised to fall within relaxed skin tension lines (RSTL), but if the incision line approaches the lid margin, it should move into a more perpendicular-to-lid-margin position to avoid any potential secondary tension vectors on the lower lid (**Figs. 8.1A–C**) (see also **Fig. 1.1** regarding RSTL near free margins).

Key Points

- Side-to-side repairs over curved surfaces may require a longer length-to-width ratio beyond 3:1 to avoid persistent tricones at the poles of the incision.
- As an incision approaches the lid margin, its direction should become more perpendicular to the lid margin to avoid secondary tension vectors causing ectropion.

Figure 8.1A. Surgical defect on the lower eyelid, primarily over the orbital rim and eyelid skin.

Figure 8.1B. Side-to-side repair following the relaxed skin tension lines. Over convex surfaces, the length of the incision may have to be increased from 3:1 to 4:1 to prevent persistent standing cones.

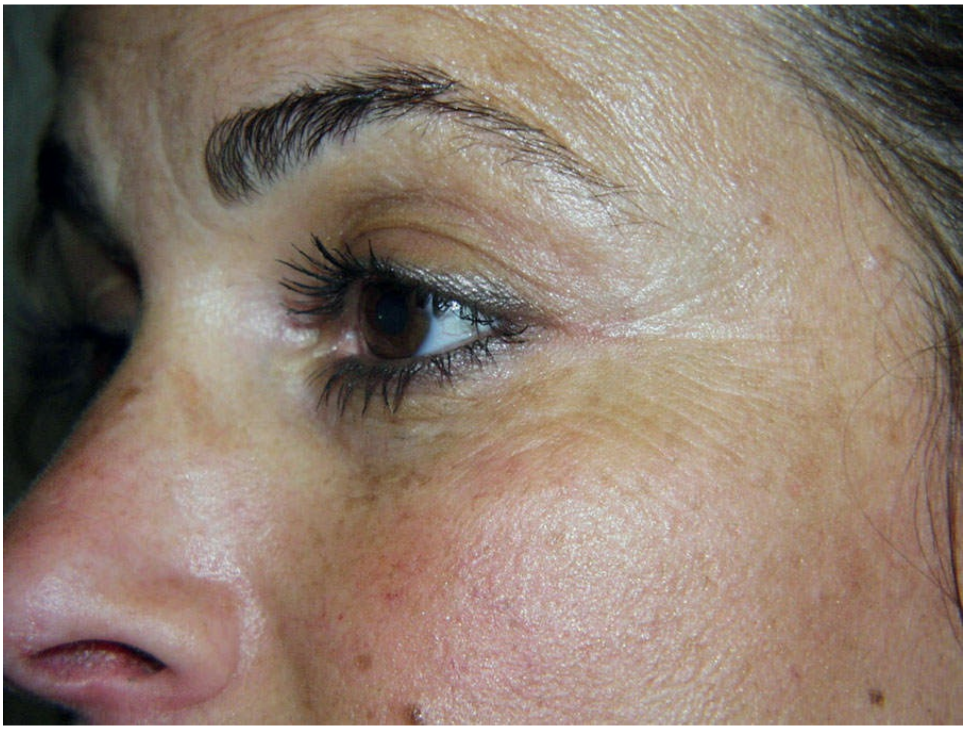


Figure 8.1C. Final healed appearance. Incision line and resultant scar well hidden in relaxed skin tension lines.

8.2 LOWER EYELID: WEDGE EXCISION REPAIR

For small- to medium-sized defects that involve less than 25% to 30% of the lower eyelid margin, a wedge excision repair provides an excellent solution to a seemingly difficult defect (**Fig. 8.2A**). The full-thickness defect is expanded slightly to fit an inverted pentagonal shape, which helps to evert the lid margin and decrease risk of ectropion or notching of the lid margin. The wound is closed with one or two tarsal sutures (e.g., 5-0 or 6-0 polyglactin 910), placing the knots on the anterior aspect of the tarsus to avoid potential irritation of the conjunctiva associated with posteriorly placed knots. Another buried absorbable suture may be used to close the oribicularis muscle. A 6-0 or 7-0 silk suture may be placed at the gray line on the lid margin using a vertical mattress or simple interrupted technique to ensure eversion of the lid margin. Another similar silk suture may be placed at the lash line. The ends of both of these silk sutures should be kept long as they will be tied down and away from the lid margin to avoid corneal irritation. The remaining cutaneous surface can be closed with silk or other nonabsorbable (e.g., polypropylene) simple interrupted sutures with the most superior suture(s) also used to tie down and away the lid margin and lash line silk sutures (**Figs. 8.2B and C**). There are no sutures on the conjunctiva of the lower eyelid.

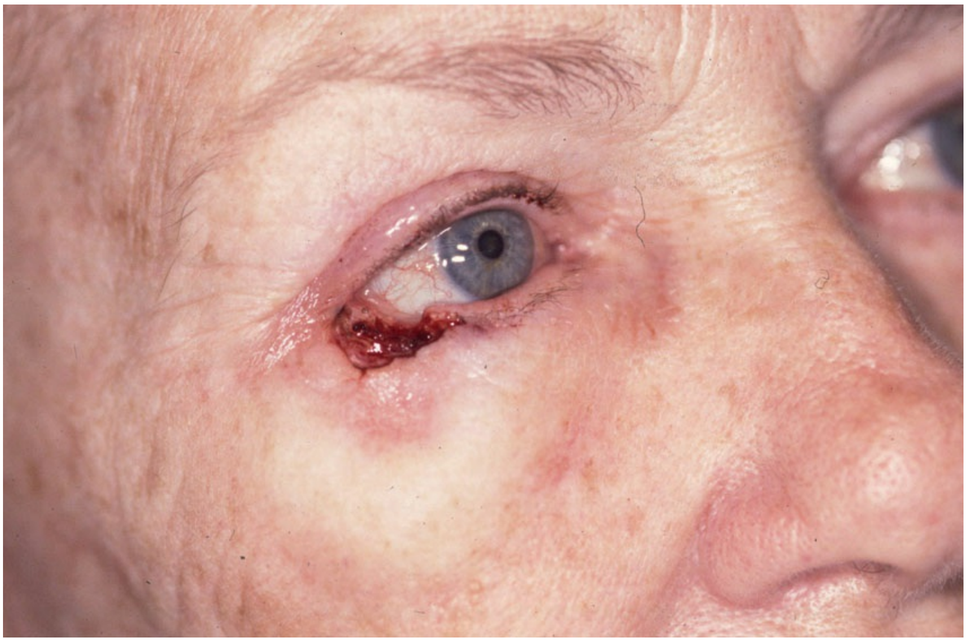


Figure 8.2A. Irregular shaped defect constituting approximately 30% of the lower eyelid. The wound will be converted to a full-thickness, inverted-pentagonal shape for closure.

Figure 8.2B. Wound is closed as a wedge excision repair in layers. Silk sutures on the lid margin are left long so they can be tied down to the cutaneous surface of the eyelid and away from the margin and cornea.

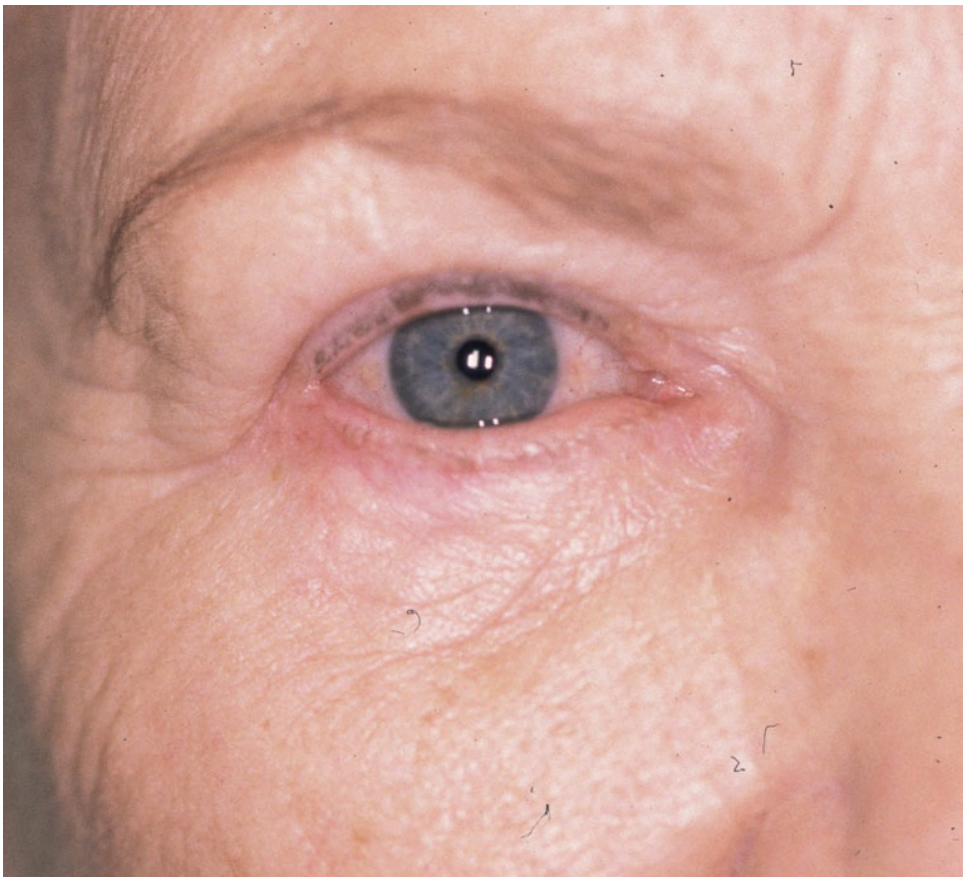


Figure 8.2C. Final healed result.

For slightly larger defects or in patients with a little more tension (e.g., younger patients), a lateral cantholysis can be performed (**Fig. 8.2D**). Excessive tension on the closure can lead to lid margin notching, entropion and corneal irritation from the eyelashes. To perform a lateral cantholysis, a horizontal incision is made through the skin of the lateral canthus to the orbital rim. The lateral lower eyelid is grasped and pulled medially and slightly superiorly. This exerts stretch on the inferior limb of the lateral canthal tendon, located between the orbicularis oculi and conjunctiva. The inferior limb of the tendon is exposed, and a pair of iris scissors is used to cut the inferior limb of the tendon, which provides immediate release and additional movement to close the wound (**Figs. 8.2E and F**). The remainder of the procedure is performed as with a standard wedge excision repair, and the cutaneous incision at the lateral canthus is repaired with additional percutaneous sutures (**Figs. 8.2G and H**).

Key Points

- Defects up to 25% to 30% of the horizontal lid margin length can be repaired with a wedge excision repair. Slightly larger defects may be

closed following lateral cantholysis, which may provide an additional 5 mm of movement for closure.

- An inverted pentagonal shape helps evert the lid margin and prevent ectropion or notching.
- Corneal irritation should be avoided by keeping tarsal suture knots on the anterior side of the tarsus. In addition, lid margin and lash line sutures should be kept long and tied down on the cutaneous eyelid skin.

Figure 8.2D. Surgical defect involves almost 40% of the lower eyelid, avoiding the lacrimal punctum.

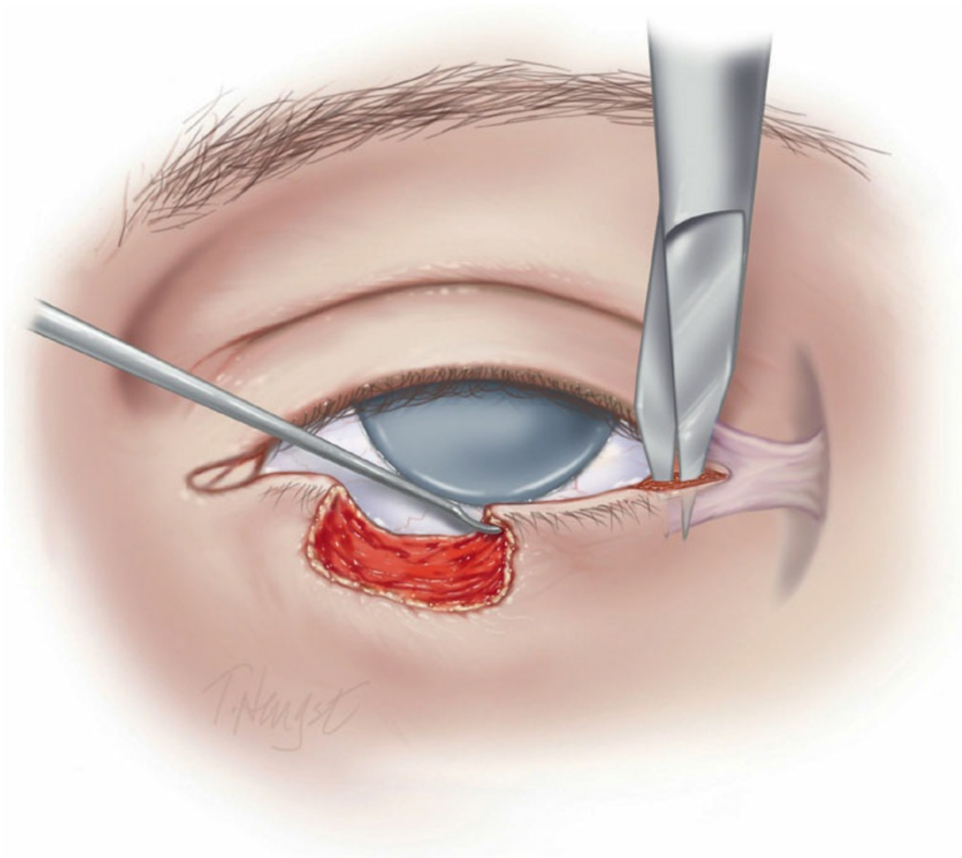


Figure 8.2E. An incision is made at the lateral canthus to the orbital rim in a horizontal direction. The lid is put on stretch, pulling medially and slightly upward. The inferior limb of the lateral canthal tendon is identified posterior to the orbicularis muscle and anterior to the conjunctiva. The inferior limb of the lateral canthal tendon is cut, immediately releasing the lid medially. (Corneal shield in place to protect the cornea during reconstruction.)

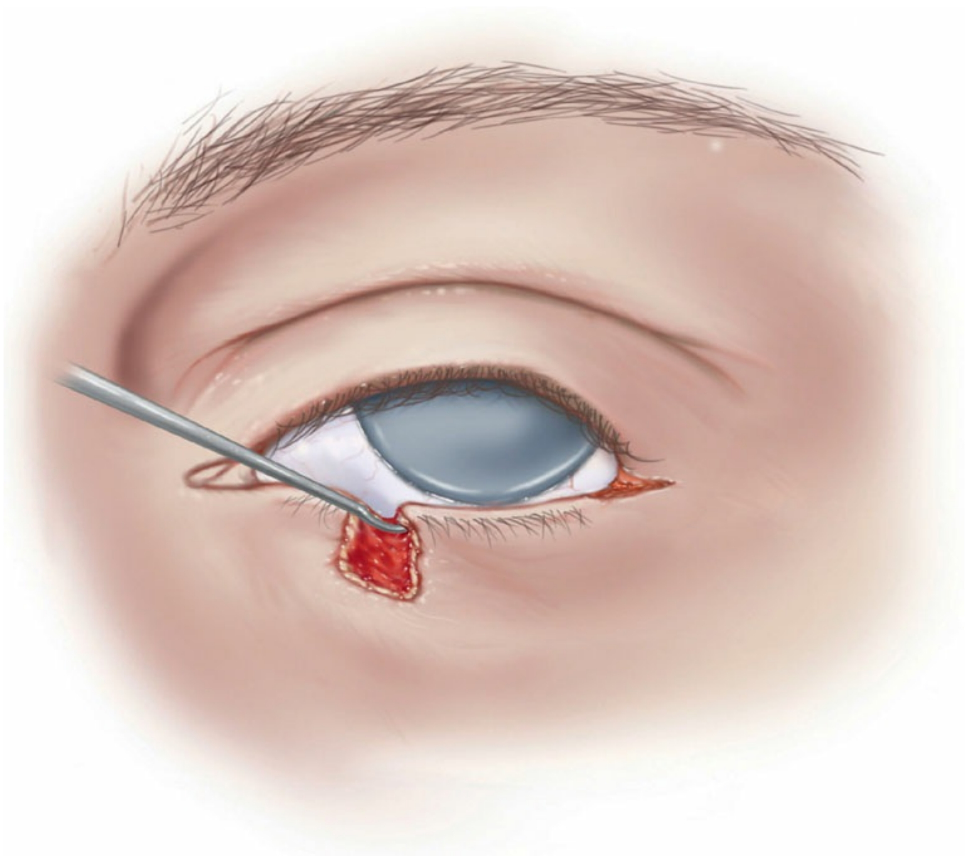


Figure 8.2F. Lateral cantholysis causes immediate release of the eyelid, providing up to 5 mm of additional movement for closure.

Figure 8.2G. Lateral cantholysis allowed wedge excision closure of surgical defect.

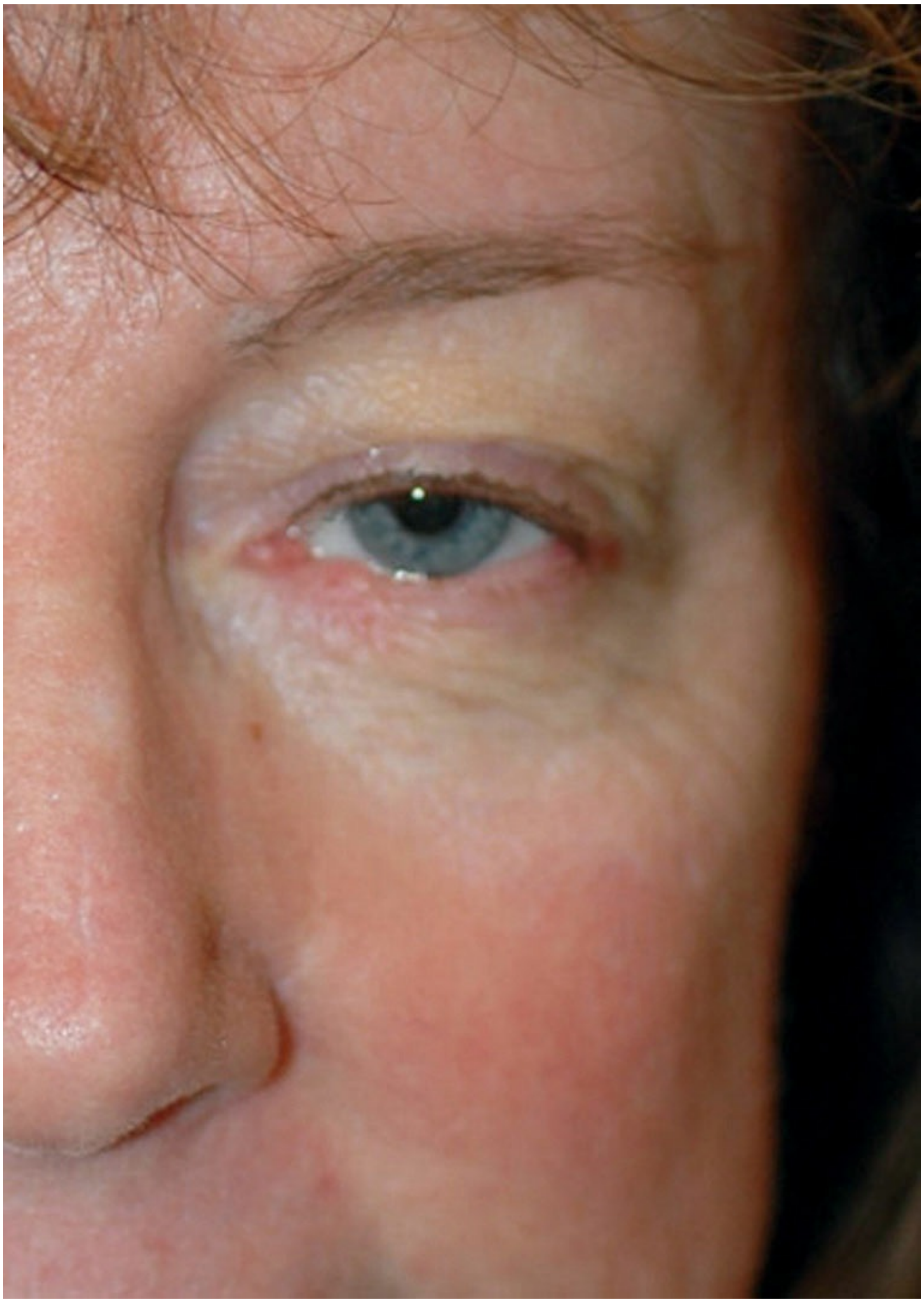


Figure 8.2H. Healed appearance after 3 months.

8.3 LOWER EYELID: ADVANCEMENT FLAP (AND FULL- THICKNESS SKIN GRAFT)

In this example, the defect on the lower eyelid approaches but does not involve the lid margin or orbicularis oculi and therefore requires restoration of skin and soft tissue only (**Fig. 8.3A**). The available loose tissue for this lower eyelid defect is primarily located on the temple and lateral cheek. In this case, it was determined that adequate loose tissue was

available laterally on the zygomatic cheek to complete the repair.

In a younger patient or a larger defect or a relative lack of available tissue for repair, reconstruction could have been completed with a larger rotation flap. With a rotation flap, the incision starts out in the same direction but then curves upward with the high point being at a point on the temple superior to the lateral canthus before it curves downward in front of the hairline and pretragal crease (see Section 3.7).

In the current example, the incision for the advancement flap stops on the zygomatic cheek at a point level or slightly higher than the superior border of the surgical defect. The flap moves medially, being certain to avoid undue tension on the wound or downward traction on the eyelid margin. In this case, the advancement flap was utilized to repair the defect from the infraorbital crease downward in order to avoid secondary tension vectors on the eyelid margin. The small area superior to the infraorbital crease was repaired with a full-thickness skin graft (donor site: tricone excision on the infraorbital cheek). The advancement flap essentially functions as a sling to support the lower eyelid and minimize postoperative ectropion (**Figs. 8.3B and C**).

Figure 8.3A. Broad superficial surgical defect on the lower eyelid involving skin and subcutaneous tissue and extending to the eyelid margin.

Figure 8.3B. Advancement flap reconstructs the majority of the defect and functions as a sling for the lower eyelid, minimizing risk of postoperative ectropion. A full-thickness skin graft reconstructs a portion of the lower eyelid without risk of secondary tension vectors directly on the lid margin. Grafting of the eyelid margin without some sort of stabilization risks ectropion.

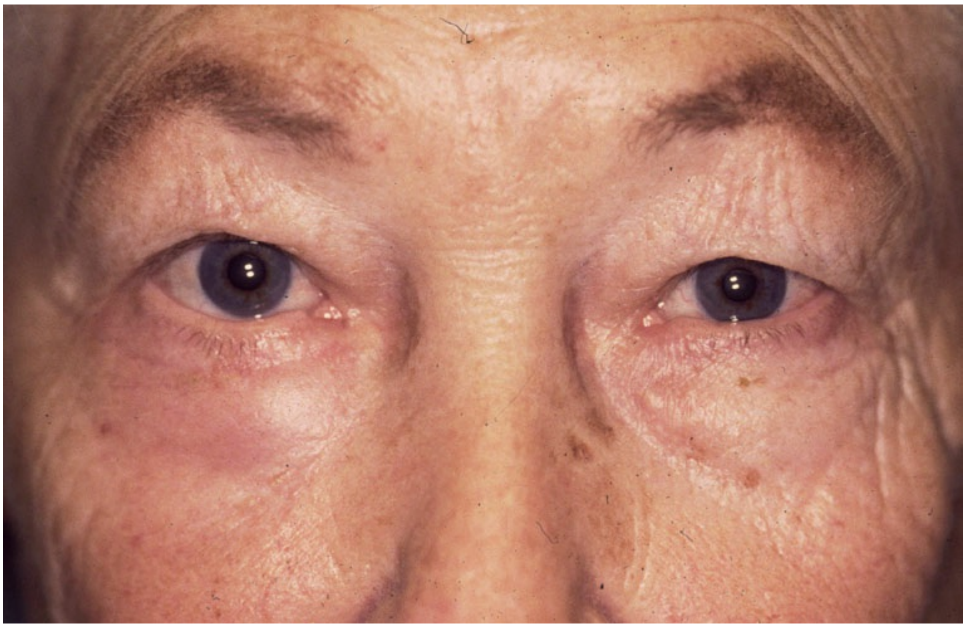


Figure 8.3C. Final healed appearance after 6 months.

In this repair, the incision ended on the zygomatic cheek where a tricone was excised, placing the tricone excision within a periorbital rhytide. The first absorbable sutures in the leading edge of the flap should generally be at the level of the orbital rim or cheek, and tailoring or suturing of the flap above the orbital rim can be completed after the flap is secured in place.

Finally, a tricone or standing cone was excised inferior to the defect, placing the tricone excision within the RSTL on the infraorbital cheek. This tricone was thinned and sutured into place as a full-thickness skin graft on the lower eyelid skin adjacent to the lid margin.

Key Points

- The defect involves two cosmetic units, the lower eyelid and infraorbital cheek. When surgical defects involve more than one cosmetic unit, combining of more than one repair should be considered to avoid alteration of the subtle boundaries between units.
- An advancement flap was utilized to reconstruct the defect from the lower eyelid crease downward and a full-thickness skin graft for the small remaining defect on the eyelid to the lid margin. Advancement flap closure in a direction perpendicular to the lid margin not only avoids downward tension on the eyelid but also functions as a supportive sling and prevents potential ectropion following surgery.
- Adequate lax tissue was available laterally to perform an advancement flap. Another option would have been a rotation flap (see Section 3.7), which could recruit a greater amount of tissue for repair.

8.4 MEDIAL CANTHUS (AND NASAL ROOT): ROTATION FLAP

There are a couple of options to consider for a defect on the medial canthus. This particular defect is a little larger, extending onto the nasal root (**Fig. 8.4A**). Second intention healing can be an excellent option for defects on concave surfaces, such as the medial canthus. This is particularly true for defects that are not too deep and are evenly balanced above and below the medial canthal tendon. Potential downsides to second intention healing are prolonged wound healing and potential tension on nearby eyelid margins. Another option is a full-thickness skin graft, which will reconstruct the surface and minimize potential scar contracture. Disadvantages of a graft repair could be a slight difference in color, texture, and thickness between donor and recipient sites, minor depression of the healed repair, and need for graft “take” or survival for the repair to be successful.

Figure 8.4A. Surgical defect on the right medial canthus and nasal root.

Another option applied in this example is flap reconstruction. The adjacent loose tissue is located on the nasal root and glabella. Two options could be used to move the tissue from the nasal root and glabella to the surgical defect. One is a rhombic transposition flap, and the other is a rotation flap. Although a rhombic transposition flap could be designed to fill the defect, the problem is when the secondary defect is closed, it may significantly decrease the distance between the eyebrows or potentially distort the shape or position of the brows. In this case, the eyebrows are tattooed, and any distortion or displacement could be a permanent problem. To minimize potential medial movement of the brows, a rotation flap was designed to

reconstruct the defect. An incision was made from the superior–posterior point of the defect in an arciform fashion superiorly, falling within the glabellar furrow just medial to the brow (**Fig. 8.4B**). A back cut was made at the distal point of the incision to facilitate movement of the flap. After adequate undermining, the flap was advanced or rotated into the surgical defect and sutured into place. By choosing a rotation flap in this instance, the size of the secondary defect is less than a transposition flap, and more evenly spread out. As a result, there is less movement centrally of the medial eyebrows. After rotating and advancing the flap into the defect and suturing into place, a standing cone forms over the nasal dorsum, and tissue from the back cut crosses the incision (**Fig. 8.4C**). The excess skin at each of these locations is trimmed and sutured into place (**Figs. 8.4D and E**).

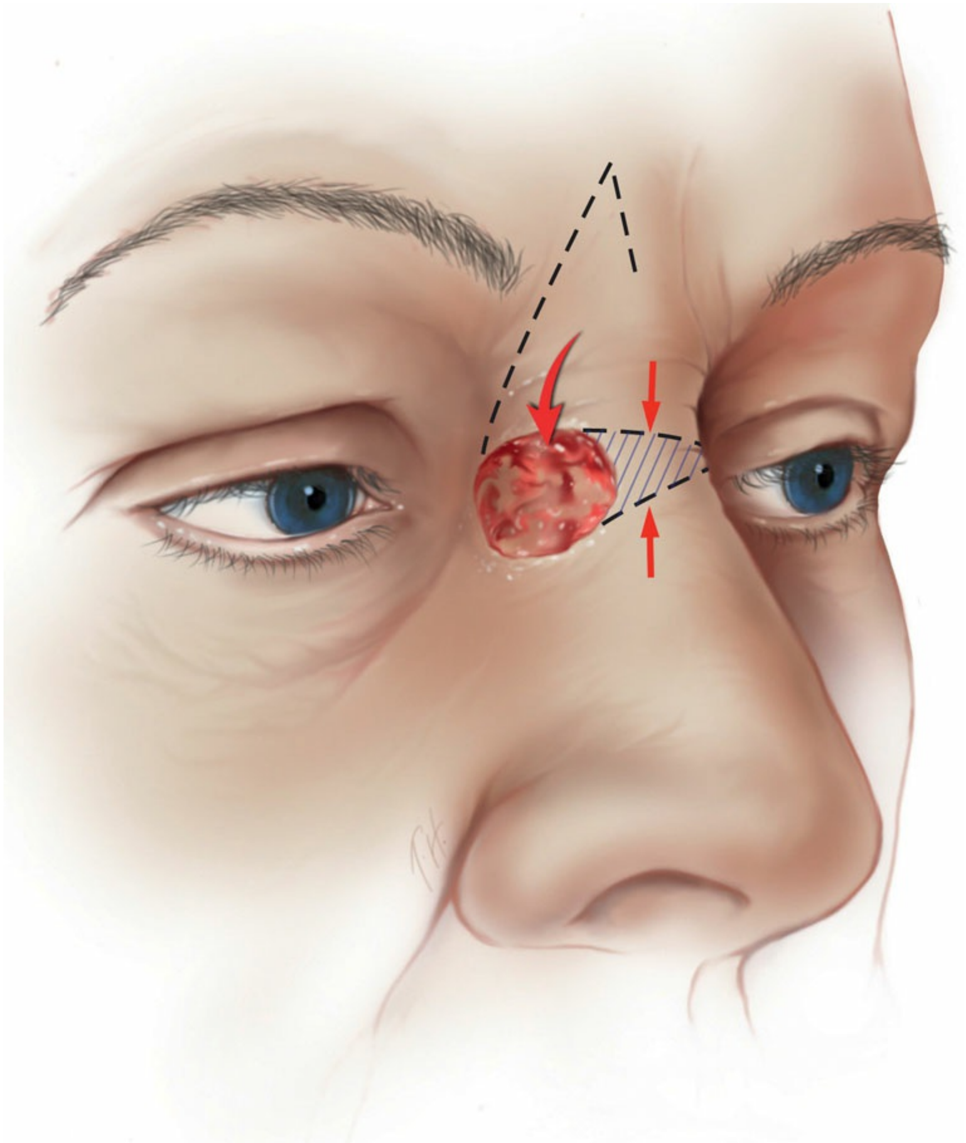


Figure 8.4B. Design of rotation flap. Incision starts at the superior–posterior point

of the defect and travels superiorly in an arciform fashion between the eyelid and nose, reaching the glabella through the glabellar furrow. As the flap is rotated downward, a standing cone develops on the nasal dorsum at the point of rotation.

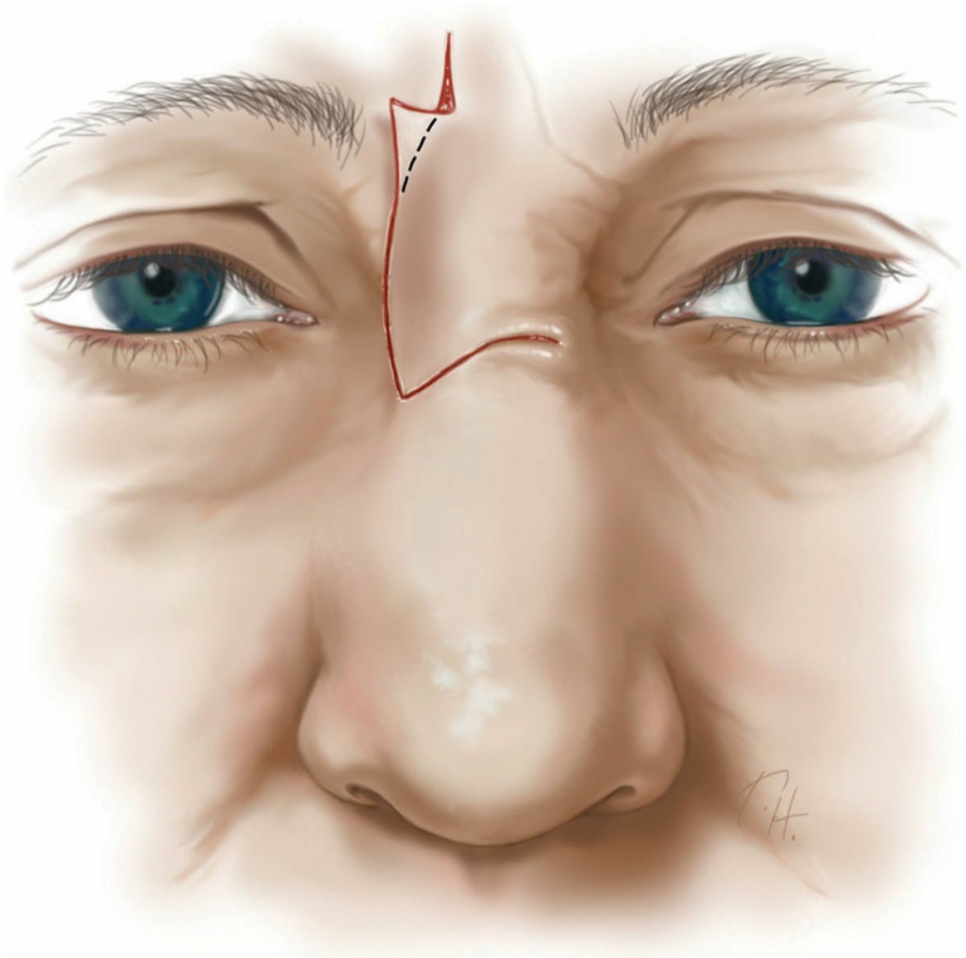


Figure 8.4C. As the flap is sutured into place, a standing cone forms on the nasal dorsum and excess tissue from the back cut cross the incision. At both locations, redundant tissue is removed and wound edges closed.

Figure 8.4D. Immediate appearance after rotation flap repair. Note the incision line placement within glabellar furrow and preservation of eyebrow position.

Figure 8.4E. Healed appearance at 4 months.

Key Points

- Defects on the medial canthus may be allowed to heal by second intention healing with good results. This is particularly true for defects balanced above and below the medial canthal tendon, superficial defects, and defects not immediately adjacent to the lid margin.
- Choosing between a rotation and transposition flap sometimes comes down to differences in distribution of secondary defects. While a transposition flap minimizes potential tension at the surgical defect,

the secondary defect on a rotation flap is more evenly distributed than the secondary defect on a transposition flap. As a result, in this example, there is less chance of eyebrow movement medially with a rotation flap.

- With advancement and rotation flaps, the flaps should be moved and secured into the surgical defect first. Tricones and redundant skin should then be trimmed. (In transposition flaps, the secondary defect should be closed first; then, the flap should be secured into the surgical defect and excessive or redundant tissue should be trimmed.)

8.5 LATERAL CANTHUS: RHOMBIC TRANSPOSITION FLAP (AND MEDIAL CANTHUS REPAIRED BY RHOMBIC TRANSPOSITION FLAP)

In this case, the surgical defect involves the lateral lower eyelid adjacent to the lateral canthus (**Fig. 8.5A**). Although an advancement or rotation flap could repair this wound, one of the key benefits of transposition flaps is that they are best able to redirect tension away from the primary defect. Because of this, transposition flaps are particularly useful near free margins and anatomical landmarks. Compared to advancement and rotation flaps, transposition flaps tend to be smaller and the incision lines multiple and broken up so that it may be more difficult to place incision lines within rhytides or anatomic-unit junctions. In evaluating "donor" sites for tissue, there are a couple options for this surgical defect. Sometimes the upper eyelid can function as a source for a transposition flap, pivoting around the lateral canthus. This may be an option especially in older patients (with more abundant upper eyelid skin) and for relatively small defects. In these cases, it may also be necessary to perform an upper lid blepharoplasty on the contralateral eye to maintain symmetry.

In this particular case, the flap was designed to transpose tissue from the temple just lateral to the orbital rim. The flap comes off the surgical defect at the superior–posterior aspect of the defect. The key is to make sure that the width and length of the flap is large enough to fill the defect and minimize any tension on the lower eyelid. Because this is a transposition flap, the secondary defect should be closed first (i.e., temple), allowing the flap to transpose easier into the surgical wound. A small tricone is excised from the flap, angling away from the flap's pedicle and falling within a

perceived or anticipated periorbital rhytide (**Figs. 8.5B and C**).

Figure 8.5A. Surgical defect on the lateral aspect of the left lower eyelid.

Figure 8.5B. Transposition flap from the temple (lateral to the orbital rim). A small, standing cone or tricone is excised from the point of rotation and avoids cutting into the pedicle, falling within a periorbital rhytide.

Figure 8.5C. Short-term healed result.

The second case is a 1.7 × 1.4 cm defect on the right medial canthus following Mohs micrographic surgery of a basal cell carcinoma (**Fig. 8.5D**). Compared with the example in Section 8.4, this defect is slightly smaller and limited to the medial canthus, extending slightly closer to the lid margins. A rhombic transposition flap recruited tissue from the nasal root and glabella and avoided deviation of the lid margin. One key point is that the flap is taken from the right nasal root and glabella and away from the superior–posterior edge of the defect that is still within the medial canthal region. If the flap was begun within the medial canthal subunit, closure of the secondary defect might have distorted the medial aspect of

the upper eyelid. Instead, the flap originates in a separate cosmetic unit, the nose, but closure of the secondary defect does not affect the upper eyelid (**Figs. 8.5E and F**).

Figure 8.5D. Surgical defect on the right medial canthus.

Figure 8.5E. Rhombic transposition flap recruits loose tissue from the nasal root and glabella. Key point is that the flap originates on the more anterior aspect of the defect edge so that tissue is recruited from the nasal root and glabella, and closure of the secondary defect does not affect the upper eyelid.

Figure 8.5F. Healed result. Sometimes these flaps may develop some mild trapdooring, which is usually managed with massage and if necessary, intralesional steroids.

Key Points

- Transposition flaps, such as the rhombic transposition flap, are particularly useful near free margins like the medial or lateral canthus, as they are more effective at redirecting tension away from the primary surgical defect.
- In both examples, the flap was designed so that closure of the secondary defect did not distort nearby anatomical landmarks or free

margins. In the first example, the flap originated from the superior–posterior aspect of the defect, recruiting tissue from the temple side of the orbital rim. In the second example, the flap originated from the superior–anterior aspect of the defect, mobilizing tissue outside of the medial canthus. In both instances, the objective was to place the secondary defect incision where it would be well hidden and away from the looser, more delicate eyelid skin, which would be more easily pulled or distorted.

- Couple of key points to transposition flaps that bear repeating include the following: (1) close the secondary defect before transposing and suturing the flap into the surgical defect, and (2) excise the tricone at the point of rotation or pivot point so that the excision does not cut into the pedicle and potentially jeopardize the vascular supply.

8.6 LOWER EYELID AND CHEEK (AND LATERAL CANTHUS IN SECOND PATIENT): COMPLEX LINEAR REPAIR AND ADJACENT-TISSUE FULL-THICKNESS SKIN GRAFT

The next two examples have distinct similarities, which resulted in a similar reconstruction for different periocular locations.

The first example is a surgical defect involving the lower eyelid and infraorbital cheek following Mohs surgery for a basal cell carcinoma (**Fig. 8.6A**). The patient has a moderate amount of lid laxity and senile ectropion preoperatively, and the defect extends from just below the lid margin onto the infraorbital cheek. In actuality, this defect involving the lower eyelid and infraorbital cheek could have been closed in exactly the same fashion as the example in Section 8.3, using an advancement flap and full-thickness skin graft. Because this patient is older and there were concerns about using a larger flap reconstruction with potential bruising and risk of postoperative bleeding, a different, simpler repair was performed. The inferior aspect of the wound was closed in a side-to-side or complex linear fashion rather than utilizing an advancement flap, but the concepts are identical, close in cosmetic units, recruit lax tissue laterally, create a stable foundation to prevent ectropion, and graft the remaining superficial defect with skin of most similar color, texture, and thickness.

Defects involving more than one cosmetic unit should be considered for reconstruction with more than one repair. In this instance, by closing the wound at the junction of the two cosmetic units (eyelid and cheek), we have created a sling or support for the lower eyelid, helping to mitigate the effects of senile ectropion and gravity (**Fig. 8.6B**). In addition, by closing the defect at the junction of the two cosmetic units at the orbital rim, a standing cone of tissue forms on the infraorbital cheek (**Fig. 8.6C**). Because this skin is adjacent to the surgical defect, it is most similar in terms of color, texture, thickness, and degree of actinic damage. The tricone is excised, keeping the incision within RSTL, and the skin is used as a full-thickness skin graft in the remaining surgical defect on the lower eyelid (**Fig. 8.6D**). A tacking suture and tie-down dressing are used to secure the graft to the wound bed, and the healed picture demonstrates a good cosmetic and functional result and even mild improvement in the preoperative ectropion (**Fig. 8.6E**).

Figure 8.6A. Surgical defect involves the lower eyelid and infraorbital cheek. The patient has moderately severe actinic damage and preoperative senile ectropion. (From Kaufman A. Periorbital reconstruction with adjacent-tissue skin grafts. *Dermatol Surg* 2005;31:1704–1706.)

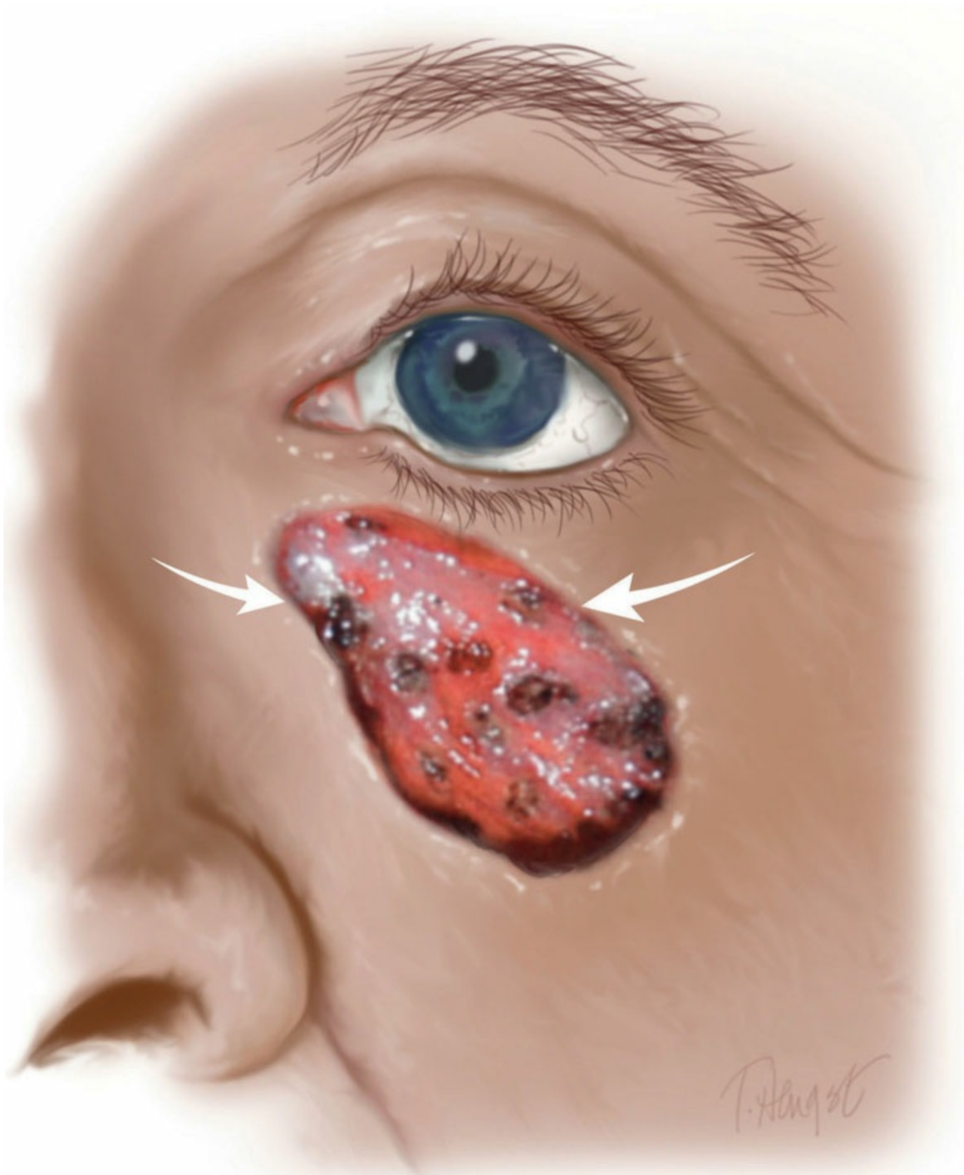


Figure 8.6B. The multiunit defect is reconstructed with separate single-unit repairs. The infraorbital cheek portion of the defect is closed in a side-to-side fashion with 4-0 absorbable, buried vertical mattress sutures beginning at the orbital rim.

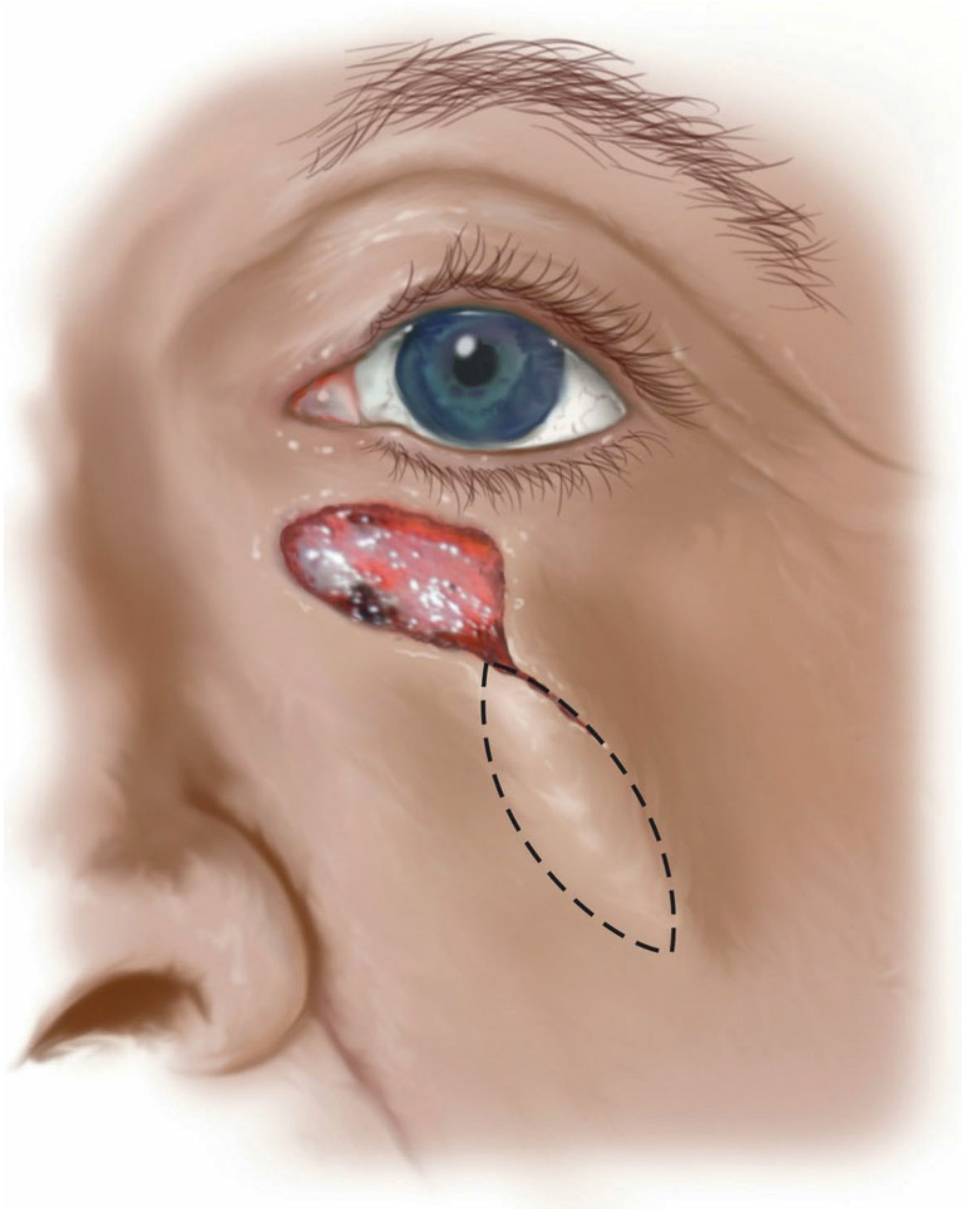


Figure 8.6C. Closure at the orbital rim helps to mitigate any senile and postoperative ectropion by removing some of the lower eyelid laxity and preventing the weight of the infraorbital cheek from dragging the lower lid downward. This closure at the orbital rim creates a large standing cone on the cheek, which will be excised and utilized for a full-thickness skin graft repair of the lower eyelid.

Figure 8.6D. The cheek is closed along relaxed skin tension lines. The lower eyelid is repaired by a full-thickness skin graft from adjacent tissue (hence the name, “adjacent-tissue full-thickness skin graft”). Closure and support at the orbital rim help to improve the preoperative senile ectropion and decrease the risk of postoperative cicatricial ectropion. (From Kaufman A. Periorbital reconstruction with adjacent-tissue skin grafts. *Dermatol Surg* 2005;31:1704–1706.)

Figure 8.6E. Final healed result with improved eyelid position and incision and scar fairly well hidden on the cheek. (From Kaufman A. Periorbital reconstruction with adjacent-tissue skin grafts. *Dermatol Surg* 2005;31:1704–1706.)

The second example is a larger defect on the temple and lateral canthus following Mohs micrographic surgery for a lentigo maligna (melanoma in situ on chronically sun-damaged skin) (**Fig. 8.6F**). Because of its size and location, the most likely option for repair of this defect is a graft. By closing the "easier" portion of the defect (i.e., the area away from the free margin of the lateral canthus/upper eyelid) in a side-to-side fashion along RSTLs, a standing cone is created. The skin of this standing cone is adjacent to the defect and therefore is likely more similar in surface

characteristics than a graft from a more standard donor site (e.g., pre- or postauricular). After closure of the inferior portion of the defect in a side-to-side fashion and removal of the standing cone within RSTLs, the removed tissue is thinned of subcutaneous fat and tissue and sutured into place as a full-thickness skin graft in the residual surgical defect adjacent to the lateral canthus and upper eyelid (**Fig. 8.6G**). Compared to second intention healing, a graft decreases contracture and potential deviation of the free margin of the lateral canthus or upper eyelid. Because the graft came from adjacent tissue, the color, texture, thickness, and degree of actinic damage is an excellent match to the missing skin (**Fig. 8.6H**).

Figure 8.6F. Surgical defect on the temple, lateral canthus, and lateral upper eyelid following Mohs micrographic surgery for a lentigo maligna (melanoma in situ).

Figure 8.6G. Portion of surgical defect adjacent to loose tissue is closed in a side-to-side fashion, which creates a large standing cone. The standing cone is removed as a tricone, and the wound closed along relaxed skin tension lines. The tissue from the tricone excision is thinned of fat and subcutaneous tissue and used as a full-thickness skin graft for the remaining defect on the lateral canthus and lateral upper eyelid. Fenestrations in the graft, tacking sutures, and a tie-down dressing improve the chances of graft survival.

Figure 8.6H. Final healed result at 6 months shows good color, texture, thickness

match, and avoid deviation of free margins.

Although adjacent-tissue skin grafts can provide an excellent match for the appropriate surgical defect, the repair is not without limitations or potential complications. The surgical defect should be superficial and provide a suitable wound bed for graft placement. The adjacent standing cone, from which the graft is harvested, should provide sufficient tissue to completely cover the residual defect. Tacking sutures and tie-down dressings increase the chance of neovascularization and graft survival, but like other skin grafts, graft failure is a potential complication. Still, in appropriate circumstances, adjacent-tissue skin grafts provide a good match in repair of superficial defects and a useful technique for reconstructive surgeons.

Key Points

- Defects involving more than one cosmetic unit should be considered for reconstruction with more than one repair, and each repair is responsible for reconstruction of one cosmetic unit.
- Through partial closure of the larger defect with a side-to-side repair, the size of the remaining defect is decreased and a prominent standing cone develops. Excision of this standing cone or tricone is utilized as an adjacent-tissue skin graft. Key is to choose closure in the direction of RSTLs and (when possible) close the defect at the junction between two cosmetic units.
- A full-thickness skin graft by itself for the large defect in the first example might have risked ectropion. Side-to-side closure at the orbital rim functions as a sling and mitigates some of the lower eyelid and infraorbital cheek laxity.
- An adjacent-tissue skin graft provides a graft donor site with more similar color, texture, and degree of actinic damage to the recipient site. In addition, surgical defect size is decreased; closure may be completed in cosmetic units, and time necessary for repair may be decreased.
- The graft should be thinned of all fat and subcutaneous tissue and be carefully sutured into the wound bed. Consider fenestrations and tacking sutures within the graft and a tie-down dressing to better approximate the graft to the wound bed and increase graft survival.

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